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THE LAND OF SHEBA

H. StJ. B. PHILBY

Seventh Asia Lecture. Evening Meeting of the Society, 15 November 1937

I HAVE been asked by your President and Council to deliver the Asia Lecture, the seventh of the series, and I need hardly say how much I appreciate the honour of selection for this task. It was nearly twenty years ago that I first had the honour of speaking before the Society on my first crossing of the Arabian peninsula from the Persian Gulf to the Red Sea: a journey that had only once been performed before, by Captain Sadlier in 1819. With the recent development of motor transport in Arabia that feat has become a commonplace affair. It must have been performed at least thirty times in the last seven or eight years, and twice it has been performed by ladies. To-night my subject is a part of a journey made by me last year from the Mediterranean coast to the Indian Ocean: certainly the first recorded crossing of Arabia from north to south (or vice versa) by any human being, though it is possible that in the days of the old spice trade it was a simpler and commoner matter than it is now. The Queen of Sheba herself may very well have made the journey about three thousand years ago.

Two years ago, on 16 December 1935, Miss Freya Stark read a paper on her travels in the Hadhramaut country. A serious illness had prevented the realization of her ambition to visit Shabwa, which had never been visited before by any European. When she spoke, neither she nor her audience seemed to know that a young German, named Hans Helfritz, had actually succeeded in reaching Shabwa while Freya Stark lay ill at Shibam. His stay there was too short and too uncomfortable to produce any results of scientific value. But the fact must be acknowledged that he was the first European to see the ruins of the old Himyarite capital and to photograph them. This he did while its inhospitable modern inhabitants were deliberating not whether to kill him but how to kill him. His courage and resource, coupled with the bad marksmanship of the Shabwa folk, enabled him to get away safely with at least a photographic record of some of the ruins.

On the occasion of Freya Stark's lecture Sir Percy Cox was in the chair.

In his concluding speech there occurred a remarkable passage which I should like to quote. "To my mind," he said, "a journey from Mukalla right along the hinterland, through the western confines of the Great Arabian desert to Taif would be a very fine piece of travel, about the only piece of the Arabian peninsula that is entirely unexplored." It is precisely that piece of travel which I am here to tell you about to-night. And it is a curious coincidence at least that, at the time of that meeting, I was actually at Riyadh discussing with Ibn Sa'ud, the great Arabian King and a very good friend of both Sir Percy Cox and myself, the project of a journey to the southern provinces of his Kingdom which, favoured by circumstances, I was able to expand into a more ambitious venture covering the whole of the only piece of the Arabian peninsula that was entirely unexplored. The unveiling of this unknown corner of the Asian continent is, I think, an appropriate subject for an Asia Lecture. The death of Sir Percy Cox we must all deeply deplore as a grave loss to the still small band of serious students of Arabia. I am glad to think that he knew, before he died, of the accomplishment of this particular dream of his by one whom he himself had first sent to Arabia. I deeply regret that my old chief is not here to hear the detailed story of the journey.

From Riyadh I went on to Jidda and Mecca, but it was not till several months later that I was able to make an actual start on the southern part of my journey. On 18 May 1936 I left Mecca to join the King in his camp at 'Ashaira on the main Riyadh motor-route. With his usual generosity His Majesty offered to provide the necessary funds for my journey as he had previously done for my exploration of the Rub' al Khali. On this occasion however I preferred to be completely independent so as to involve nobody, much less the King and his Government, in responsibility for my actions. And, in view of certain suggestions that have been made in various quarters regarding the alarmingly military character of my escort, I must state, once and for all, that I bore the whole cost of this expedition myself and that none of my companions at any stage of this journey was in receipt of any emoluments from any other source than my pocket. So, with the King's blessing and goodwill, I set forth on the first stage of my journey from 'Ashaira on May 21 with three motor cars and seven or eight companions. With me I had a theodolite, not of the most modern pattern, for astronomical observations and a long and medium wave wireless set with which I could get Greenwich time and the daily news and, occasionally, more frivolous entertainment from Jerusalem and Cairo. Unfortunately the stations at those two centres seldom agreed about the exact time, though their golden voices invariably apologized very charmingly if they were ten or twenty seconds late with the news. Dr. Comrie and his staff, who have undertaken the checking of my observations, have consequently had a good many difficulties to contend with, though I think we can claim, as a result of their endeavours, that the map prepared from my material is accurate within about one minute of arc. For a vast area of unexplored territory, where some of the names placed tentatively on our existing maps, *e.g.* Shabwa, are as much as 30 miles out of position, this degree of accuracy would seem to be sufficient for all practical purposes. I was of course fully equipped with natural history collecting material and was able to bring back a large assortment of birds, mammals, reptiles, insects, minerals,

fossils, and antiquities. These latter include a great number of rock inscriptions and graffiti, which have received or are receiving the attention of the British Museum authorities and other experts. The maps of this huge area of unexplored territory are the result of the strenuous labours of Mr. H. F. Milne, and of the staff of this Society, and I should like to acknowledge my great debt to them both on this and previous occasions. The course of my journey is shown on the sketch-map following p. 96.

Owing to the immense *Harra* or lava-field extending between Khurma, Turaba, and Ranya, the first part of the journey necessitated the fetching of a wide circuit eastward to Khurma and some way beyond it, and then southward. Fortunately the western part of this lava-field had already been traversed and mapped by me in 1932 when returning from Wadi Dawasir *via* Bisha along what is known as the "Road of the Elephant"—the route of the Abyssinian expeditionary force under Abraha, which came up from the Yaman in A.D. 570 with the intention of attacking Mecca. The elephant, or elephants, accompanying this expedition has given the route its historic name, though farther south in the neighbourhood of Najran the road is attributed to As'ad Kamil, one of the Himyarite rulers of the Yaman in the fourth century A.D., about the time of the first appearance of Judaism and Christianity in Southern Arabia as rivals to the ancient astral religion of the country. Abraha's expedition is represented as having been stayed short of Mecca by a miraculous attack by swallows. This has been interpreted by the Higher Criticism as indicating an outbreak of smallpox or some other virulent disease among the invading army. And it was certainly a curious coincidence that at the time of my journey the people of Khurma and Ranya were suffering grievously from a local fever that generally comes, they say, in the train of exceptionally good floods in these great valleys. This seasonal disease would certainly seem to call for expert investigation. Meanwhile, and particularly at Khurma, the death rate was appalling and the local cemetery was rapidly extending its boundaries.

As the result of my two journeys along the western and eastern fringes of this great lava-field I think it may be claimed that its extent and position on the map—to say nothing of the numerous volcanic cones that dot its inhospitable surface—have been pretty well established. In its northern sector the great valley of Wadi Subai' (known in its upper part as Wadi Turaba) traverses its whole width, the great oases of Turaba and Khurma lying in it respectively at its entrance into and exit from the lava-field. The wadi rises far back in the Hijaz mountains at a height of about 8000 feet, and the information I gleaned from my guides was that only a thin ridge separates the head of this wadi from that of Wadi Ranya which eventually runs down through the southern part of the lava-field to the oasis of Ranya on its eastern side. The Subai' wadi does not join that of Ranya but peters out in the desert against the long sand strip of 'Arq Subai'. The Ranya wadi runs, soon after leaving the oasis, along the southern edge of these sands and ultimately joins the Bisha wadi which comes up from the far-off southern mountains. The great Tathlith wadi, coming from a still more southerly point, joins these two to form the head of Wadi Dawasir.

At Ranya we came in for a terrific thunderstorm with heavy rain, as the

result of which the wadi was in flood, though we had no great difficulty in getting our cars across it in the upper part of the oasis where it has carved its way through a formidable range of high basalt mountains in a deep and picturesque gorge. The oasis itself, which I had already visited in the company of the King in 1934, is rather disappointing though the architecture of the great clay fort-residence of the local Shaikh is unusual and rather attractive. It was here that the King in 1934 met the Crown Prince and his army returning from the Yaman campaign. In spite of being a stage on the main motor road to the south, Ranya is rather a miserable spot without any great political importance. Its setting of lofty crags and mountains is however quite impressive.

A little way beyond it we came to a lofty cone of pure white sand known to the local folk as Abal Dufuf, "the father of drums." Its name is sufficient to betray its reputation for "singing sands," but the recent rains had somewhat dulled its music. Nevertheless I found that, by rather vigorous tobogganing down its slopes, I could set up a reaction resembling the sound of a string orchestra tuning up. The motor track now ran south in a wide corridor flanked on one side by a broad strip of sand dunes of some height and on the other by a wide wedge of basalt mountains. Farther on we came to an immense plain dotted with rocks and ridges of granite and basalt with nothing of particular note except the wells of Jahiliya at the southern end of the Kaur massif. The plain is traversed by a succession of drainage channels, which combine farther east in Wadi Rashida to pass through a fringe of hills on the way to join Wadi Bisha. We camped that night (May 25) on the southern watershed of this wadi system, and next morning traversed a wide sandy plain which may be regarded as the basin of Wadi Tabala. This channel joins Wadi Bisha itself about the middle of its great oasis and some miles downstream of Dailami, in whose palm groves we camped. I was now on ground made familiar to me by my 1932 journey, when I entered the great wadi at Junaina, its most northerly village and visited all its settlements up to Raushan and Nimran, the twin market towns which with the great fort of the Governor constitute the capital of the district.

On the present occasion also I visited these places and was lucky enough to be there for the two market days—Wednesday at Raushan and Thursday at Nimran. The former is devoted exclusively to stock—camels, sheep, etc.—but the latter is open to all kinds of produce, and it was interesting to see congregated in one spot the denizens of the high mountains, the oasis folk, and the Badawin from the desert plain. The line of Wadi Bisha roughly divides the two great tribes of Shahran and Qahtan, the former occupying the mountains right back to the fringe of the great escarpment facing the Red Sea. From the angle formed by Wadi Tabala and Wadi Bisha the Subai' tribe extends northwards through Ranya to Khurma. Eastwards of Wadi Tathlith lie the Dawasir. The most interesting element at market was however the mountain folk with their picturesque costumes and broad-brimmed straw hats. Men and women—the latter in smocks of black, red, or yellow—mingled in the throng, but a special section ot the Suq was reserved for the women pedlars selling a great variety of goods—ropes, mats, spices, dates, coffee, and groceries—while in the men's booths I saw saddlery, leather goods

Ranya

Remains, possibly of a sun temple, on Manqa' plain

A wooded valley, Wadi Harjab

Rock with inscriptions in the Hima valley

Inscriptions near Wadi Itwad

Lion's head from Najran

of all kinds, piece-goods, arms and ammunition. In all this country the most important villages have their special market days and the people seem to spend the whole week itinerating with their wares from one place to another. At Bisha, on its two market days, the Governor and the local Qadhi are kept busy hearing law suits which have accumulated during the week. So far as I have been able to discover no European has ever visited Bisha except a German named Leopold Weiss. Colonel Wauhope and Tamisier (a century before him in 1834) collected information about routes to the oasis, but neither appears to have visited it, and Bisha has hitherto been shown on our maps nearly a degree farther east than it actually lies.

Beyond Bisha southwards as far as Najran, about 200 miles away, the country was wholly unexplored. Wadi Bisha itself runs up from the oasis through mountainous country quite unsuitable for wheeled traffic. We accordingly kept well away to its east—incidentally this was also the route of the Elephant—after crossing its great tributary of Wadi Harjab, which joins it a few miles south of the oasis. Our course lay for the next two days about midway between the two channels over a rocky plain traversed by numerous torrent beds, running for the most part into the Harjab, though some of them found a path through the ridges on the Bisha side. Away to our east line after line of rocky ridges extended far back into the desert towards the lower reaches of Wadi Tathlith and Wadi Dawasir. The first night out from Bisha found us at the well of Bir ibn Sarrar, which according to local tradition was dug by the army accompanying the Elephant. Solitary hills and more extensive ridges rose here and there about us to a height of 400 or 500 feet above the plain. But there was little of outstanding interest until we came on the second night to the head of Wadi Harjab, where the broad sandy channel is covered with a regular forest of large trees—'Alb (or Sidr) and acacias.

At the well of Fadhaya, in a small tributary of this wadi, we came upon a large gathering of Badawin watering their flocks. All this country belongs to the Shahran tribes, many of whose subsections we encountered, generally in small groups. Not far beyond this point we came to the watershed dividing the Bisha valley on our right from the greater and more distant Wadi Tathlith. And in due course we came to the first of the greater tributaries of the latter, namely the broad valley of Wadi Musairik, in whose bed we camped at the considerable oasis of Khaibar, lying at an elevation of about 5500 feet or more above sea-level. It consists of half a dozen hamlets, each with its palm groves and corn-lands and a large number of wells, as well as a large pond of flood-water at the upstream end of the oasis. The wells here are not too deep—about 4 or 5 fathoms—and are simply sunk in the valley soil without masonry lining. At one newly excavated well I saw three women drawing water: a grandmother with her daughter and granddaughter all of a mature age, though the granddaughter had not yet succeeded in finding a husband. They were much intrigued by my butterfly-net and were very anxious to know what I did with the birds I was collecting at the time. They suspected, I think, that I was on the look-out for medicinal ingredients in the stomachs of my victims. Below the Khaibar oasis there are, I was told, a dozen or more palm groves and hamlets at intervals down Wadi Musairik which actually joins Wadi

Thafn, which in turn joins the main Tathlith channel. The people of these settlements are all Shahran. The rocks on the left bank of the valley had a number of Thamudic (or proto-Arabic) inscriptions and some graffiti—the first trace of the ancient inhabitants of this region so far met with on this journey.

A rough and rather tedious tributary of Musairik, named Wadi Shid, led us southwards for a considerable distance to the road-fork, from which one motor track runs south-east to Najran and another, which we now followed, westward towards Abha. The country was rather dreary with its eternity of granite and basalt rocks and ridges. To my mind the true desert, where the eye can range for immense distances over practically featureless flats, is never irksome, while low hilly country, which limits the vision, becomes exceedingly monotonous. With the welcome exceptions of the Harjab forests and the Khaibar oasis, the whole country south of the Bisha oasis was of this type, but we had now very nearly come to the end of it and were making for the really high mountain range which began to be visible, beyond Abha.

We were now once more on the Bisha side of the divide and, after a night in the midst of a rock-bound plain where for the first time I saw the very characteristic pink-flowered shrub, called '*Adan*, of the southern highlands—incidentally it was here I first found the Abyssinian dove, hitherto unknown from Arabia, while the typical grackle was plentiful among the wild fig trees on the rocks—we came to the first group of Shahran settlements in Wadi Qarara (or Tindaha), a tributary of Wadi Bisha. Here there was a delightful string of pools, practically forming a continuous strip of water for several miles between wide, flat, grassy banks, on which there were cattle browsing, while the noise of our cars disturbed a flock of wild geese. The rocks about here swarm with the new mountain chakor, which I discovered in the Taif neighbourhood in 1934. At sunrise I saw them lined up in scores on the skyline, apparently waiting to welcome the dawn and, incidentally, to warm themselves in the first rays of the sun, for the nights, even in June, were chilly enough with a temperature of about 55°.

Beyond Qarara a vast rocky plain intervened before we reached the channel of Wadi Bisha at the chief of all the Shahran settlements, Khamis Mushait. The wadi here runs in a broad flat channel with extensive corn-lands on either side, irrigated from floods and wells, and more than a score of villages, large and small, scattered over a length of about 10 miles. The height here is about 6500 feet above sea-level and there are no palms, but the wheat is of excellent quality, and I do not think I have ever tasted more delicious bread than that provided by my Shahran hosts as part of their sumptuous meals. It was almost like shortbread though unsweetened. At Khamis Mushait, the headquarters of the paramount Shahran shaikh, Sa'id ibn Mushait, we seemed to have entered the portals of civilization—a civilization very different from that of the outside world or even of such Arabian cities as Mecca and Madina and Riyadh, where European standards are increasingly establishing themselves. The civilization of the 'Asir towns is indigenous and has a standard entirely of its own. The Turks never actually controlled this district but were in political relations with the Shahran chiefs. They did however build, with military labour, a road for wheeled traffic between Abha, the capital of the

province, and Khamis Mushait. So the social standards of the former tended to establish themselves in the latter, and in nothing more effectively than in the internal decoration of the better houses. The artists were apparently all women, both slaves and free, who had imbibed ideas on the subject of domestic decoration from their Turkish masters or husbands. The style was entirely geometric, consisting of lines, curves, circles, and triangles, but they were applied in a variety of colours, which gave the rooms an air of intimate charm and cosy comfort. The houses themselves were all of clay construction, some of the better ones extending to the dimensions of fortress-like palaces, and of a most attractive architectural style. To some of them were attached pleasant gardens of fruit trees, but this addition to the amenities of life is of very recent growth. The peace, which is now enjoyed by the 'Asir province in common with the rest of Sa'udi Arabia, will doubtless stimulate progress in this direction.

On a subsequent occasion I was able to explore for some 20 miles farther up the Bisha valley to another group of scattered settlements, known as Bishat ibn Salim and belonging to Qahtan elements (Rufaida) who control the upper reaches of Wadi Bisha to its source amid the high ridges of the great escarpment about 10 or 15 miles to the south. In the Bishat ibn Salim area I saw the masonry remnants, scattered over a wide area, of an old city, probably dating back to ancient times. The chief feature of the ruins was a large mill-stone measuring 6 feet in diameter, but I saw no sign of inscriptions. In its neighbourhood was a large granite hummock reputed, in local tradition, to conceal ancient treasure. We found none of it, but in a fair-sized copse of acacia trees, with thick pollarded trunks, I was glad to encounter a large colony of the Arabian woodpecker and thus to extend far to the southward the range of a remarkable bird which I had discovered some years before near Taif.

Bishat ibn Salim has its local market day on Sundays, and its chief settlement is commonly known as Suq al Ahad. Khamis Mushait, as its name implies, does its marketing on Thursdays. The scene on such occasions in the great open space between the villages of Qambar and Darb on the left bank of the wadi is more interesting than in the Bisha oasis. The crowd is more distinctly of a highland type, the men wilder looking and wearing short kilted skirts, while the women are mostly unveiled and wear taller, broader-brimmed straw hats in the Yaman style. There is also a greater air of liveliness and gaiety, and the ladies, if all is true that is said of them, are not as prim as they should be according to Najdi standards. The bride-price is correspondingly lower than in the Wahhabi country—only about £1 in English money. At the same time the women of the mountains have a high reputation for domestic efficiency.

Wadi Bisha is joined near the northern extremity of Khamis Mushait by a channel called Itwad descending from the escarpment southward of Abha. In it are a number of villages, while at the point where the Abha road crosses it, stands a great block of dark granite covered with inscriptions and graffiti. Close by it a hole in the rock is pointed out as the manger of 'Antar, one of the pre-Islamic heroes of Arabia. As the Khamis Mushait area must have been in occupation as a human settlement from very early times it is possible

that these features may have had some connection with the ceremonies of the ancient astral religion of southern Arabia. Legend indeed speaks of a Ka'ba (or place of pilgrimage) in connection with a locality called Khalasa, and it is at least a curious coincidence that the nearest of the Itwad hamlets goes by that name. I do not think however that with the scanty material available it would be possible to press this coincidence further.

The road now passes over a switchback of low ridges and shallow valleys—a hard rocky surface but good enough for motor traffic—out of Shahran into 'Asir territory. The actual boundary is marked by a large masonry bake-oven which was set up here by the Turkish troops engaged on building the road to provide themselves with bread. About half-way lies the village of Hijla on a wadi of the same name, which runs down to Wadi Abha as the latter carves its way through the hills to join Wadi Bisha some way below Khamis Mushait. The channel at Hijla runs between well-wooded banks with large acacia trees and serried masses of wild figs. It was full of birds, including the Abyssinian dove, green pigeons, bright yellow weaver birds, and the beautiful glossy starling. But the most attractive feature of Hijla was its numerous tall watch-towers, telling a tale of former unrest though now deserted and rapidly falling to pieces. They are built entirely of clay but reinforced, to stand the relatively greater rainfall of these parts, by rings of slates set horizontally in the clay and protruding about a foot outwards at intervals of 8 or 10 feet from top to bottom. The village consists of two rather miserable hamlets of small huts of clay and masonry. Beyond it at intervals in shallow valleys we came upon other villages of a similar type. Seeing one, rather larger than the rest, I inquired its name. That is Abha, said my guide.

I had expected a town of imposing dimensions and appearance. It was certainly not that, though from the road we could only see part of it. As we swung clear of the ridges concealing it, it looked better, and the great fort-residence of the Governor, containing all the Government offices and the barracks of the garrison, was certainly imposing enough. But Abha is a great name in Arabian history. Its appearance falls very far short of its reputation, and I was duly disappointed. In fact it is but a congeries of villages and hamlets, grouped so close together as to form a small town, round the large open space of the market which is dominated by the fort. Behind it runs the great ridge of the 'Asir mountains rising to a height of about 2000 feet or more above the town, which stands over 7000 feet above the sea. And all round the town, on every convenient spur or hillock, ran a circle of forts, now derelict and abandoned, though in Turkish times they were all manned by troops to keep the hostile Arab tribes at bay. I had expected to find the place surrounded by gardens and cultivation, but in this also I was disappointed, though of recent years they have begun to make the capital more worthy of its position than it was ever able to be in the days of turbulence that marked the Turkish occupation. In those days the Idrisi of Sabya frequently contested the Turkish claim to rule and there was constant war, while the local 'Aïdh dynasty, closely associated during the past century with the Wahhabi power of Najd, fought intermittently against Turk and Idrisi alike. The Great War eliminated the Turks, and in 1920 Faisal ibn Sa'ud, the present viceroy of Mecca, occupied Abha and all the highlands of 'Asir, leaving only

the Tihama lowlands to the Idrisi till 1926, when they too were annexed to the Wahhabi dominions. Since then there has been peace.

I spent a fortnight (the first half of June) at Abha as the guest of the Governor, a brother-in-law of the King. Apart from the Turks I was, so far as I knew, the first European visitor to these parts, but, in the course of my peregrinations in the neighbourhood, I discovered the grave of a Greek merchant, known to the local folk as Khwaja Baulo. He had apparently come up here in the train of the Turkish armies to seek his fortune and had found a grave, quite an elaborate one marked by a wide circle of large stones. Disappointing as the place had seemed to me at first sight, it certainly improved on acquaintance. Its houses, built of clay with horizontal lines of slates to protect them from rain as at Hijla and grouped into villages on a series of low eminences in a shallow arc on the right bank of the wadi (with a few scattered hamlets on the other side), gave the impression of pagoda-like temples. Confronting the arc stood the immense Government fortress, whose construction betrays its piecemeal growth through the centuries, culminating in the great white tower built by the Wahhabi Government in quite recent times. From one corner of it rises a crazy pylon of metal and timber supporting the aerial of the wireless station. The opposite, and probably oldest, part of the building serves as the Governor's residence—a warren of dingy chambers, couloirs, and staircases leading to the main reception rooms, behind which extend the private apartments. One outstanding feature of Abha is a fine masonry bridge of several arches, spanning the river on the road leading to the great mountain passes by which communication is maintained between the highlands and the coastal plain. The nearest of these passes, only about 5 or 6 miles from the town, is that of Dhila', whence a steep zigzag track plunges down to the wadi of that name, which it follows to its junction with Wadi Itwad at Darb Bani Sha'ba village and so to Shuqaiq and the sea. The most northerly and most important of the three passes is Sha'ar, at the head of Wadi Taiya on the road leading through Mahaïl to Qunfidha. At the edge of the escarpment stands a large, gloomy fort of the old Turkish regime, built of black basalt masonry and commanding the steep winding track climbing the hillside from the valley 2000 feet below. Small guard-posts are disposed about the lip of the precipice and on a low ridge commanding the approach from Abha. A wide flat open space between the ridge and the precipice gave the Turkish troops room for drill and training. A pond of permanent water provided for their most urgent needs, and a large cemetery athwart the track at the head of the pass must have warned each newly arrived contingent that few of its numbers would ever see Constantinople again. The existence of all these outlying garrisons of imperial Turkey must indeed have been a pathetic one. It was a case of exile till death. But officers and men settled down to it with a stoical indifference to their fate. Most of them married women of the country, and the 'Asir province has a large Turco-Arab population as the result of about sixty years of Turkish occupation from 1872, when the opening of the Suez Canal enabled the Ottoman Government to take the administration of its Arabian dependencies more seriously. Unfortunately they had to spend most of their time defending themselves against the intermittent hostility of the large Arab population of the mountain villages. In such

circumstances there was little chance of progress, and the backward state of the 'Asir highlands, intended by Nature to be a paradise, is the inevitable result of man's inability to live at peace with his neighbours.

The Sha'ar and Dhila' passes are not much higher than Abha itself. But between them runs a band of lofty mountains rising to a high point of about 9500 feet at Suda on the edge of the escarpment, probably the highest village in Sa'udi Arabia. Here Nature and man have certainly combined to create a scene of astonishing beauty, and it seemed to me that man had actually outdone Nature in their friendly rivalry. Imagine a great table-land thrust up to a height of 9000–9500 feet, towering above the tumbled mountains and valleys of the Tihama on one side and the endless expanse of mountains and desert on the other. The surface of the plateau, plunging steeply down on one side in a series of splendid buttresses, slopes gently on the other in the curves of graceful valleys, forming huge theatres, for which man has provided the seats in terrace after terrace of cornfields. In the middle of June the corn was ripe, and I shall never forget that scene of golden ears soughing and bowing under the gentle breeze, terrace after terrace, down the mighty flanks of those mountains, whose steeper slopes Nature had reserved for her own planting—a dense forest of junipers and other trees extending down to the 7500-foot level. And in the fields and forest the birds rejoiced. It was the breeding season, which varies in Arabia from early January to the middle of the year. In the juniper tract there were linnets and magpies and chakor in immense flocks. In the fields, larks of many kinds, including the charming little red-headed lark, which ranges south from the Taif area apparently to the Yaman. The magpie, an unexpected bird in a country like Arabia, was a new sub-species, larger than its English cousin. The linnet had only been found before by Wyman Bury in the Yaman highlands. And on the rocks of the highest hump of these mountains were carved pictures of the ostrich, the ibex, and the oryx.

Man was almost as primitive as the animals. Suda and the villages about it were groups of houses so close together that only the outer ones could have doors. The rest had their doors in the roof, serving also as chimneys and windows. And the normal way to visit a neighbour was to descend upon him from the sky. The atmosphere of these houses was utterly incredible: large smoking wood fires with no outlet but the front (or top) door, and darkness secure against the slightest interference from the sun. Bugs and fleas enjoyed it well enough; the human occupants preferred it to fresh air; my own companions liked it for the unusual charm of female companionship. But even that could not reconcile me to the idea of sleeping in that death-trap, while my kindly hosts warned me that I would not survive the night if I slept on the roof under the stars in that perishing cold. Next morning my levée was attended by the whole village—solicitous men completely encircling me, roguish children skirmishing into the interstices between them to smell my killing-bottles, and examine the dead moths, and the bright eyes of admiring ladies forming an outer circle of astonishment. No man had ever survived such an experiment before because no man had ever tried it. The people of this mountain backbone of the country between the Dhila' and Sha'ar passes are of the 'Asir confederation (four clans) who

have given their name to the whole province. South of them lie the Shahran at the head of Wadi Itwad with Rufaida Qahtan beyond them. North lie Bal Ahmar, Bal Asmar, and Bani Shihr. The 'Asir are also represented among the Tihama mountain valleys by seven other clans. The terrific gorges which fall abruptly from the escarpment westwards make a splendid spectacle. Their drainage gathers in the great Wadi Sha'bain and passes out into the coastal plain by the village of Rijal al Ma.

From Abha we returned on our tracks to the road-fork already mentioned and passed once more into the Tathlith basin. Not far from the fork a fine volcanic cone rises like a pyramid out of the plain. Its summit afforded a splendid view of the surrounding country, but was more interesting for two other reasons. The smooth faces of the rock were covered with inscriptions and pictures mostly too worn to be legible. And the basalt rocks of the upper part of the hill stood up vertically like the pipes of an organ. They were also highly magnetic, an experience which I had again and again in this country of ancient volcanoes, and my compass behaved in an extraordinary manner. It was most disconcerting and I had to disregard my compass bearings from all such localities. About 10 or 15 miles farther on we came to the first of the great valleys which properly constitute Wadi Tathlith, whose name, of course, merely means "the Trinity." Wadi Tarib, with the fair-sized oasis of Tarib in its bed at the point where we reached it, rises far back on the eastern slope of the ridges which form the head of Wadi Bisha and flows down to the great barrier of the Tabab range, through which it cuts in a deep gorge with the palm-settlement of Subaikha at its entrance and that of Kuhaif at its exit to join the main Tathlith channel at the edge of the desert plain. The next channel eastward, Wadi 'Arin, rises in the mountains south of the Bisha-Tarib divide, and runs down, with occasional small settlements in its bed, between two lofty mountain ridges to cut through a narrow gap between the eastern ridge and the southern end of Tabab. It joins the Tathlith in the plain south of the Tarib confluence. At the point where it begins to pass through the gap stands the great mountain of Sunbula rising about 1000 feet above the valley and entirely composed of a red porphyry whose colours varied according to the light from pink to purple. We climbed to the summit for our first full view of the desert beyond the mountains and camped at its foot on the night of June 18. And there, early next morning, my prophesy of a partial eclipse of the sun was duly fulfilled to the uneasy admiration of my small party. Unfortunately we were too far south for a really good show, only about a third of the disc being eclipsed at the climax. It took us about an hour or so of easy going to arrive at the wretched little oasis of Hamdha in the bed of the main valley. It has no regular habitations, but there are two guard-posts on low hillocks to command the wells in the event of an enemy's approach. The people (Qahtan) seemed poor and miserable, with only small flocks of sheep and goats. The settlements of the Tathlith trinity do not in any way compare with those of Wadi Bisha, which can boast three large oases. In Tathlith there are only scattered palm groves with a very sparse settled population and serving rather as *points d'appui* for a mainly Badawin element. In the upper reaches of Wadi Tathlith however, far away in the southern mountains that fringe the great escarpment, the valley and its

numerous tributaries support a teeming settled population of Sinhan and other Qahtan elements, living in small hamlets and raising grain crops with a little fruit. There are no palms there, Hamdha being the uppermost palm grove at the northern end of a very narrow ravine through which this important channel carves its way for 4 or 5 miles. It seemed to me rather astonishing that it should have chosen this route in preference to a wide tract of silt-mounds, doubtless of its own creation in the past, which lies immediately to the west of the rocky area of the gorge. We chose the easy route among the silt-mounds for the cars, which could certainly not have negotiated the gorge.

Half a day's journey above Hamdha lie the wells of Amwah, beyond which the Tathlith channel lies wholly in a mountain setting, the upper part of which I explored later on during my wanderings up to the actual source of the Wadi at 'Aifa on the flank of a basalt ridge, which for a long distance both ways forms a flat-topped cap to the schists and other metamorphic rocks of the great escarpment. The altitude of the sources of Tathlith is about 8500 feet, and the wadi, continued ultimately across the desert in Wadi Dawasir must, I think, be easily the longest "river" in Arabia, running through the southern part of the Rub' al Khali to the Persian Gulf. The chief market town, also the centre of an administrative district, is Haraja, on the main north–south road (the Road of the Elephant) from Mecca to San'a. As the result of this journey the mystery of the origin and course of this famous wadi has been solved at last.

The next problem to be tackled was that of the still more mysterious Wadi Habauna, which actually rises within a few yards of the source of Tathlith on the same mountain massif of Maswara. During the Yaman war of 1934 the Amir Sa'ud managed to negotiate the difficult country between Amwah and the frontier with motor cars, but we did not attempt to repeat the experiment. Instead we struck out due east away from the Tathlith channel and soon passed out of the area of igneous rocks, in which we had been travelling since the beginning of the expedition, into the sandstone tract fringing the great desert, whose western edge we were now to follow all the way down to Najran and beyond. At Amwah I had found some short Thamudic inscriptions, but in general it would seem that the ancient inhabitants of Arabia had found the hard igneous rocks of their country—granites, schists, and basalts—a serious obstacle to literary and artistic expression. The sandstone rocks we now encountered were however literally bristling with inscriptions and graffiti, and I was to spend many busy hours, day after day, under a hot sun copying these records of their activities. It should be noted however that in many parts of this more southerly area inscriptions began to be far more frequent on the igneous rocks as well. It may well be therefore that we were crossing the frontier of a cultural zone influenced by the old Sabaean civilization and that the more northerly inscriptions were the work of travellers from the south, going up to Mecca, Madaïn Salih, and Petra. The inscriptions are still being worked out by experts and I cannot yet say much about them, but many of the pictures were exceedingly interesting. In general they depict a community devoted to hunting and fighting, generally mounted on horses, with long lances and cross-bows as their weapons. The fauna of the country consisted of ostrich, oryx, gazelles, etc. Cows and serpents also make an appear-

Wadi Tarib. Duthaith granite boss

Watch-towers at Hijla

Abha: Qabil bridge

Habauna. Shatt al Khadhara

Najran. Ruins of Ukhdud fort

ance in the pictures which include some charming palm-tree landscapes. Perhaps the most striking of these rock records is the horses. Pliny in the first century A.D. recorded, as you know, that the Sheban folk had no horses, and the *Encyclopaedia Britannica* (11th edition) records that horses did not become indigenous in Arabia till about A.D. 500. It is difficult to believe that these pictures date from so late a period, and it may be suggested that the horse is an older institution in Arabia than has hitherto been imagined. Perhaps my inscriptions (in all I collected about 750 during this journey) may throw some light on the subject.

I certainly believe provisionally that the rock inscriptions and pictures date from a period when the old astral religion of South Arabia was still an effective force. As we were driving along, after passing a tract full of such pictures, I noticed by the road-side a group of large granite stones curiously arranged. I stopped to examine it and was satisfied that the arrangement was the work of man. The stones were, at any rate, set up at fairly regular intervals in two concentric circles, with one large block at one end and three blocks of smaller size diagonally opposite it, with the suggestion of an aisle lined with stones on either side between them. The largest block of stone was about the height of a man, and the orientation of the central line was N.N.W.–S.S.E. It remains only to add that the source of these granite blocks was not far distant as, having first travelled east and then south, we had almost returned to the igneous tract. I can, for the moment, only suggest that this stone circle must have been a "henge" of the ancient Arabs.

Not very far beyond it we came to the wells of Husainiya, and I had my first view of the great Wadi Habauna, which from this point runs out along a ridge into the sands of the great desert. I was subsequently able to visit practically the whole valley up to its source already mentioned. The Habauna oasis itself, a group of some half-dozen villages and palm groves, is small and rather disappointing. Beyond it and in its many tributaries are many similar oasis groups of little general interest, but the town of Badr, 6000 feet above sea-level, on a sandstone plateau at the head of one of these tributaries, is worthy of special mention. It is the headquarters of the once famous Isma'ili sect, now but a shadow of itself without any temporal power though not altogether without local religious influence. In fact the donkey men of my party during this journey began the fast of Ramdhan two days before the rest of us owing to a pronouncement of the head of the Isma'ilis which they considered binding. They certainly made up for their haste to begin the fast by rapidly succumbing to the temptation to break it. The Isma'ilis have been established in the Najran and Habauna districts for something like a thousand years, and certainly in the seventeenth and eighteenth centuries they exercised sovereign power. In one of the tributary valleys of Najran the rocks are scored with the names and dates of various Isma'ili rulers of about that time. To-day they are fallen from their high estate, and Ibn Sa'ud, when he finally occupied this country, deprived them of their last vestige of temporal importance but accorded them in its place a life pension of approximately £1 per annum, for every man, woman, and child of the hierarchy as it then existed. The town of Badr is picturesque but largely in ruins. The people are poor in the extreme. I thought it an act of politeness to announce my

intention of visiting the Isma'ili chief. He sent back a message that he and all the leading members of the family would visit me in my camp. And I realized that the reason for their action was their poverty, which made it impossible for them to entertain me in accordance with their own ideas of suitable hospitality.

In another, more central, branch of the many-headed Habauna lies the important town of Dhahran not many miles north of the Yaman frontier on the main road. It is garrisoned by a small police force and is the clearing-house for the coffee trade. Cargoes of the precious berry come up here at frequent intervals from the Yaman, and revenue officials are posted here to levy the duties payable thereon. The town consists of well-built houses of the usual fortress type with extremely dark and dingy interiors. The channel on which it stands marks roughly the dividing line between a vast tract of igneous rocks extending northwards and an area of sandstones of considerable thickness to the south. Geographically and geologically (and also to some extent culturally) Dhahran may be regarded as the extreme northern limit of the Yaman, which also, from these points of view, embraces most of the Habauna basin including Badr and the more important oases. The political boundary however runs along a more southerly line on a tribal basis, the Yam clans being wholly within Sa'udi Arabia while the Khaulan and Wa'ila elements were recognized as Yamani in the negotiations following the war of 1934. One interesting fact about Dhahran remains to be noted, namely its Jewish population consisting of a single family of half a dozen souls. I had good reason to be grateful to them, for it was just at the time of my arrival here that the tangent-screw of my theodolite stuck and I was faced with the prospect of having to abandon all attempt at astronomical observations for the rest of my journey. The paterfamilias of this Jewish household, who had never seen such an instrument before and whose normal business is the manufacture of silver and other ornaments for the ladies (to say nothing of the repair and reconditioning of rifles and other arms in former, less peaceful times), undertook to repair the damage. He certainly did it extremely well, though I do not think that my astronomical work after this date can be regarded as altogether reliable. The Habauna basin runs back to a long base of basaltic ridges forming the crest of the great escarpment. Its higher summits form important landmarks, notably the great peak of Shithath towering 1500 feet above Dhahran itself. Its head commands a fine view of the great tangle of the Tihama mountains to Faifa and other great peaks, but the basaltic rocks of the summit produced fantastic effects on my compass.

So much for Habauna. Fetching as before a circuit from Husainiya along the outer fringe of the hills with the rock-dotted sands of the Empty Quarter along our left flank, we proceeded without difficulty to a large, dark-coloured, isolated ridge called Taslal. This was rather away from the direct track, but I had been told things about it which made a special detour imperative. And I was not disappointed. Arab tradition has it that in early Islamic times rival sites of pilgrim visitation were instituted in two southern centres to counterbalance the growing importance of Mecca. One of these was at San'a, the capital of the Yaman, whose local Ka'ba, doubtless a relic of pre-Islamic times connected with the prevalent astral religion, formed the nucleus of

the great mosque of Ghumdan. The third Ka'ba was at Najran, but all memory of its location and nature has been lost in the mists of time.

As I rounded the eastern end of Taslal, I came upon a large cemetery consisting of quite elaborate tombs constructed of large blocks of untrimmed masonry. This was at any rate interesting. A second cemetery, of similar tombs, lay a little way off. Yet a third I was to find at the entrance of the Najran valley, while a fourth was found at the head of the Nahuqa pass at the western extremity of Najran on the main road leading to Sa'da and the Yaman capital. In the last case the masonry of the tombs, being sandstone, was richly inscribed with Himyaritic and Hebrew inscriptions, carved by passing travellers, doubtless pilgrims. The Himyaritic inscriptions are enough to prove a pre-Islamic date for these tombs, which may indeed go back to a far greater antiquity. It was manifest therefore that Taslal was the terminus of a highway dotted at intervals with the tombs of people dying in the course of their visitation—whatever the purpose of the latter may have been. What was its purpose? One was clear at once. The rocky massif of Taslal contains to this day a great number of natural cisterns capable of providing water for a large multitude. The plain around it would accommodate the tents and camps of tens of thousands of visitors like the plain of 'Arafat where the Meccan pilgrimage takes place. There is indeed a striking resemblance between the two localities. If religious pilgrimage was the object of the travellers, the place was ideal for the purpose.

A little way beyond the second Taslal cemetery I came upon a further clue. A pathway, still clearly marked out with stones and partly paved, ran in a wide semicircle from the base of the ridge, returning to it some 300 or 400 yards farther on. It led, as it were, from nowhere to nowhere. It was not a circular way like that round the Ka'ba at Mecca but semicircular. And there in the midst of it lay a great block of basalt rock, which was evidently the object of veneration to those who used the way. On its smooth, slanted surface was a suggestion of a picture and even of paint—too worn to be identified. But no doubt remained in my mind that this must have been the Ka'ba of Najran with its pathway of circumambulation. At the western end of Taslal were remains of what looked like the foundations of buildings and another pathway, paved, leading up on to the ridge itself—perhaps a means of access to the rock pools, perhaps a path leading to a "high place" of the old worship.

Having disposed of Taslal we made for the wide mouth of Wadi Najran, whose long, dark-green line of vegetation runs far out into the desert beyond the wells of Khadhra. The lower part of the valley, 5 or 6 miles wide, was devoid of settlements, and it was not till we reached the hill of Minara that I had my first view of the famous oasis: mile after mile of palm groves, large areas of corn-lands, huge tracts of halfa grass proclaiming the passage of abundant water, and smaller areas of actual swamps dotted with little ponds. Finally there were the fort-like mansions of the people, very beautiful in their setting of palms, very eloquent of the anarchy which was the lot of Najran until the Wahhabi peace descended on it only a few years ago and entirely changed the lives of the Yam clans, long famous for their truculence and turbulence. With close on 10,000 inhabitants modern Najran boasts nothing that can be called a village or even a hamlet. Every house of it is built within

easy musket range of its neighbour. Very occasionally one finds a group of such fortresses surrounded by a single courtyard wall, but such instances of an united family are the exception rather than the rule. Each man's hand was against his neighbour. But that is happily no longer the case, and in the great hall of the Governor I often met the chiefs of the three great clans of Najran, and they all admitted freely enough that peace and security had advantages over war and anarchy. Two of them were indeed the only survivors of a mutual ambush. They had, some years ago, agreed to meet to settle the terms of a lasting truce. Each party, suspecting the other's probable treachery, had arranged to be beforehand in the game. And the meeting had degenerated into a general engagement. And only two men escaped—the two leaders!

Nevertheless it was not always so. In ancient times Najran was one of the pillars of civilization. The ruins of Ukhdud, including a magnificent castle or palace, testify to the existence of a great city which survived until just before the Islamic period. It was the seat of a Christian bishopric. It is reputed as having been destroyed by one of the later Himyaritic kings who had accepted Judaism as the State religion and called upon the Christians of Najran to follow suit. For their refusal to do so they were condemned to death, and the Qur'an itself preserves the tradition of their extermination by burning in a great ditch or trench dug for the purpose. The Islamic name of the city preserves the memory of this tragedy, but the Himyaritic inscriptions and Strabo's account of the expedition of the Roman invader, Aelius Gallus, give us the original name of Najran. It may be long before excavation can tell the whole story of this great city, but it seems to me that it must have been one of the most important, if not the most important, centres of ancient Arabian civilization. In size the city compares with the greatest cities of the Marib and Jauf tracts. The massive masonry of the castle suggests a civilization that was certainly not surpassed, though it may have been equalled, elsewhere. And there can be little doubt now of the reason for its importance. Like Marib and Jauf, Najran owed its position in the ancient world to irrigation.

I have travelled fairly extensively in Arabia and I have seen many places which can be classed as beautiful. But no oasis of Arabia can compare with Najran in beauty. It is indeed a lovely spot: a great valley of extensive palm groves bounded on either side by lofty granite cliffs surmounted by a fantastic frieze of sandstone sierras. The broad band of the sandy channel runs like a ribbon of snow between miles of dark-green palm groves. Its source is far back in the lofty mountains about Sa'da in northern Yaman, whence it winds its way through a mountainous tract to a splendid gorge, known as Madhiq. From this, just above the Najran oasis, it debouches in a great basin from which the only escape of its flood waters is through a narrow strait between sheer rock walls, barely 20 feet wide. Here in ancient times there was a dam, the marks of which still survive. At a height of about 12 feet channels were cut out in the rock on either side to take the impounded water when it rose to that level at the dam. By a rough calculation I reckoned that the reservoir behind the dam must have been capable of holding about 100,000,000 gallons of water. Anything above this amount would have flowed out by the side canals and in the dry season the sluices of the dam would have been

opened to allow the water out to irrigate the crops. At many places there are old remains of small towns or large villages while, at Ukhdud itself, there are unmistakable traces of a moat that not only made the city an island but must have irrigated its parks and gardens. The swamps beyond the city, which absorbed the surplus water, still exist as a series of ponds—the resort of duck, herons, plovers, coots, and other water birds.

Some of you may have seen a remarkable bronze lion's head with an inscribed gutter from the Ukhdud ruins now in the British Museum. Further excavation will doubtless reveal many other treasures of the kind—the lion's head apparently dates from the beginning of our era and shows Hellenistic influence—and the place is littered with the remnants of temples and other buildings, enormous millstones, oil-presses, etc. In the castle many buildings are fairly well preserved, with a few inscriptions and symbolic pictures. The only European visitor to Najran before me was the Frenchman, Joseph Halévy, who in 1869–70 collected and recorded about a dozen inscriptions, while noting that he had found no epigraphic record of the ancient Jewish connection with the place. I was able to rediscover all but one or two of Halévy's inscriptions, but I found many more, perhaps a hundred or so, in spots which he had not been able to visit. They were not only Himyaritic and Thamudic but also Hebrew. As they are still being deciphered and studied, it is not yet possible to discuss their significance.

In all I spent about two months at Najran and can claim to have acquired a pretty thorough knowledge of the locality. Naturally I devoted rather special attention to the Sa'udi–Yaman frontier which lies a little south of Najran. Roughly speaking, the line follows the recognized tribal limits of the Yam confederacy from the edge of the Rub' al Khali to the 'Alb pass at the edge of the great escarpment, from which it descends, always following existing tribal boundaries, along the Tihama valleys and ridges until it reaches the coastal plain and traverses it to reach the sea-coast between Muassim and Maidi.

After the Peace Treaty which closed the six-weeks' war of 1934, a joint commission assembled to arrive at an agreement about the frontier line. With rare exceptions a line was rapidly agreed upon and approved by both governments. A further commission was then appointed to carry out the actual demarcation. This involved a good deal of serious discomfort, as I can readily testify. I think indeed that I can claim that no member of the commission, or any other human being, has actually followed the frontier line to the extent that I did. The commission's procedure was certainly rather curious, and not altogether unnatural considering the fact that the line agreed upon seemed designed to give the demarcators the maximum of physical inconvenience. This obstacle they overcame very simply by following the line of least resistance along the valleys at the base of the high peaks and ridges which constituted the actual frontier. For the strenuous task of putting up the frontier marks Badawin guides were deputed to scale the cliffs and mountains while the commissioners remained below to sample the coffee and Qat provided by their benevolent governments. No attempt was made to survey the boundary line as it was made, and the principal objective of my expedition was to remedy this shortcoming of the Commissioners' work.

The frontier line starts from the Red Sea coast a little north of the Yamani town of Maidi. Following the recognized tribal boundaries, it crosses the coastal plain and soon gets involved in the valleys of the foothills north of Haradh. Here we trekked among tropical jungle tracts along and athwart the main wadis, which within the mountainous country west of the escarpment were splendid streams of running water. Except in flood time they do not reach the sea. Their waters are absorbed as they advance into the sandy plain by the extensive millet fields of the Tihama centring on such settlements as Sabya, Abu 'Arish, 'Ardha, and Khauba. Within the mountains these rivers flow through magnificent gorges, whose upper slopes are dotted with hundreds of villages with terraced fields not only producing millet and wheat but coffee, Qat, bananas, papayas, and other unexpected fruit. In the valleys are acres upon acres of Daum palms whose hard-cored unappetizing fruit provide sustenance both for the primitive Badawin and for enormous troops of baboons, which move about the mountains in military formation but seem to be entirely devoid of the aggressive instincts of man.

Until the advent of the Sa'udi administration the human denizens of this lovely country were extremely exclusive and dangerous. Every now and then, as we threaded our way through these valleys along the course of charming, babbling brooks, we would pass small groups of these tribesmen without being aware of their presence until a loud challenge, echoing down the narrow walls of the gorge, betrayed them—almost invisible as their brown bodies nestled in the cracks of their brown rocks. These primitive folk must, I think, be reckoned among the most beautiful types of humanity, both their men and their women. They have camels and asses but never ride them. They walk for miles upon miles without wearying. The clothing of the men is very simple —a cloth kilt from waist to knee, a well-stuffed bandolier and a rifle, generally carried horizontally at the back of the neck across the shoulders with the arms crooked over the projecting ends. The women similarly clad, with an extra indigo-dyed sheet to cover the torso and without the arms, often relieve the men by carrying their rifles. They are all of course Muslims, but they still retain many traces of an earlier religion—in the matter of circumcision for instance, which is delayed till early manhood as a test of manly fortitude and is a most barbarous, exhausting ordeal. The Wahhabi government sternly discourages such practices, but they continue all the same and are celebrated with much firing of muskets, the sound of which, magnified by the mountain echoes, suggests a bombardment. Marriage is a lax affair and, I fancy, rather promiscuous. There is certainly no veiling of women, who take an active part in all the simple pursuits of their tribal life.

In a recent contribution to the *Journal*[1] Mr. Ingrams of Aden suggested that Wadi Masila in Hadhramaut was the only river, worthy of that name, in Arabia. In this Tihama tract however there are at least half a dozen of these rivers flowing continuously from their lofty sources to points where they debouch from the mountains on to the plain. In their deep rock-pools I enjoyed many a lovely bathe, though the people of the country regard that as a dangerous practice; nor do they drink, as I did, from the running streams. They have a lively fear of the fever which ever lurks in these tropical waters,

[1] *Geogr. J.* 88 (1936) 524–51.

Tihama. Looking up Dhamad to Qutail

Tihama. Ma'jamain rock pool

Hawiya gorge at the head of the Nahiqa valley

Umm al Khashb village

Jews of Najran

and I must confess that I also occasionally suffered from it. When they are thirsty they grub up the sand away from the stream and drink from the pools that well up into them.

A whole lecture might well be devoted to these Tihama valleys and mountains alone. From the summit of the great escarpment to the sea, this country has definitely African rather than Arabian affinities. The villages of the plain are composed of beehive huts of clay and straw, sometimes beautifully built, spotlessly clean and decorated inside with the pots and pans and mats and other basketwork of the household. At the mouths of the rivers and among the foothills extend vast parks thickly dotted with great forest trees of which the *Abra* is the most conspicuous, resembling in general appearance our horse chestnuts. In three localities I found hot springs which are visited from far and wide for their curative properties. Many of the mountains, like Faifa, Bani Malik, Raith, and others, rise steeply from the valleys to splendid peaks of 7000 or 8000 feet, terraced for 4000 feet for coffee and other cultivation. Thousands of isolated fortress mansions dot their slopes and crests. For the most part women do the porterage of merchandise, etc., up and down these mountains, but the men help with the heavier burdens. And everything they do is done with a graceful, swinging rhythm to the tune of their highland ditties. They are certainly the most musical element in all Arabia.

Through this tangled country the frontier line runs, now along the valleys, now up the knife-edged arêtes, and now along the great ridges at a height of 8000 feet until it finally reaches the brow of the great escarpment at the pass of Albain (8000 feet), whence I had a splendid view of the great rock wall that forms the western rampart of Arabia. Its sheer drop to the valleys varies from 2000 to 3000 feet, showing the underlying schists and metamorphic rocks with a covering of sandstone overlain by a 200 or 300-foot thickness of barren basalt. As I sat on the summit of the Albain ridge, surveying the country, I heard a clatter as of a horse cantering. Suddenly from around the corner a magnificent ibex appeared, cantering slowly over the rocky flat to disappear from our view round a bend of our ridge. It seemed to be unaware of our presence.

Eastward of Albain the landscape changes abruptly from a tropical country to a desert plateau of a uniform height of over 8000 feet (with higher ridges), descending to about 6000 feet at the western end of the Najran tract. It is a sandstone area with occasional cappings and peaks of basalt. Its rugged gorges and valleys have occasional wells and springs, but for the most part it is an abomination of desolation extending northward to Dhahran and southward to the limit of vision into the still unexplored territory of northern Yaman. On the Yaman side Sa'da, a large town, is the chief administrative centre, while the farthest points I could see were the hills about Suq 'Anam. All this country forms the upper basin of the Najran wadi whose main source lies in the high massifs of 'Aru, Razih, and Nadhir westward of Sa'da. The streams of this tract converge in the neighbourhood of Sa'da to form Wadi Marwan and, after a long and tortuous course, enter Sa'udi territory at the gorge of Madhiq, which becomes Najran at the narrows and ancient dam site already noted. The boundary runs along the high ground and ridges forming a marked shelf descending on the southern side to Yaman. Baqim,

Yabad, and Naq'a are the main villages on the Yaman side, the first two being the export vents of the great coffee trade. It was these villages and Sa'da which formed the objective of the Amir Sa'ud's army during the war of 1934. In following the frontier line I passed through the scene of the various engagements of the campaign, which ended in a stalemate while the Amir Faisal swept his way victoriously down the coast to Hudaida. I can testify that the terrain of the Amir Sa'ud's operations was hopeless country from a military point of view. The difficulty of bringing up provisions and munitions for the army was enhanced by the shortage of water. It must have been difficult enough to keep the frontier line intact. Advance was impossible. During my journey here in December it was extremely cold on this barren plateau. Every night we had sharp frosts and I suffered badly from chilblains, which were not improved by the constant rock climbing among the jagged crags of those ridges.

The lower reaches of the Marwan wadi form an extraordinary salient of the frontier, extending about 3 miles on a width of about 100 yards to an old tribal cemetery claimed by the tribe on the Yamani side. The hill country on both sides of the channel was admittedly Yam territory, while the status of the channel itself and the cemetery was disputed. But all along the frontier such points of difficulty were settled by a simple and exceedingly curious process, which can conveniently be designated the ordeal of the fifty oaths. The plaintiff party (the prima facie occupants being the defendants) had to nominate fifty members of their own tribe to swear their claim, while the defendants had the right to name five individuals (of the plaintiff tribe), who must be included in the fifty. Then the oath had to be unanimous, and there was seldom any difficulty about so exacting a proposition. Truth still remains in this obscure corner of the world a virtue to which men cling with grim determination. A murder can be expiated in cash or kind, but for a lie there is no remedy. A falsehood, so they think, undermines the whole structure of society.

The frontier shelf continues along the southern flank of the Najran valley to end at a point where a black hill called Thar marks the mouth of Wadi Fara' (a Yaman valley), where it passes out into the sands of the Rub' al Khali. The boundary dividing the Yaman from Sau'di Arabia on the desert side has not yet been discussed, much less demarcated. Nature has probably given as good an indication as possible or desirable of the eastern limits of the Yaman. Roughly speaking, it would seem to follow the line of my own journey which at intervals entered the Yaman hill fringe in order that we might draw water from its wells. Otherwise the hills meet the desert on a line as clear as that of the English cliffs fringing our seas. And that is Nature's boundary for the Yaman until some day an united Arabia abolishes all distinctions between the desert and the sown.

A little way up-stream of the last boundary pillar (on the Thar hillock) a group of oases nestles in the channel of Wadi Fara'. Its villages are easily visible from the frontier line and they have an active trade with Najran, whither their donkeys carry the fruit and other produce of their gardens every market day. Grapes are their speciality, and it may be of interest to note that during my sojourn at Najran I was able to buy 45 lb. of excellent

grapes for about *1s 6d* of our money. That should be sufficient indication of the astonishing fertility of these valleys. Najran itself concentrates on dates, but the great need of all this remote country is a good market for the sale of its products. A single sowing of millet in Najran produces three or four crops in the year. Wheat and barley are nearly as prolific, but prices are very low indeed. Good communications are urgently needed, and with the present development of motor traffic they should be achieved in the near future. Incidentally the whole of the Tihama plain could be converted into an important granary if irrigation works could be undertaken at the mouths of its valleys. But capital is the great need of the country. Ibn Sa'ud's country may yet prove to be productive of oil and gold, in which case capital will be available for the works that made this part of Arabia rich in the days of yore. Otherwise such works must wait for the great day when all the Arab countries will be united or federated, and all their wealth becomes available for the development of the whole peninsula.

I must not leave Najran without mention of its small but very interesting Jewish community, numbering perhaps some eighty or a hundred souls. Najran was the see of a Christian bishopric up to a little more than a thousand years ago, but no trace remains of its ancient Christianity. The Jews have been associated with this tract from the earliest times and it seems to me that the present Jewish population can be traced to two sources. The greater part of the existing community claims descent from the sons of Aaron—not of course the patriarch of that name—who came up to Najran from San'a, leaving colonies on the way at Sa'da and other places, rather more than a century ago. A few families, not connected with this recent immigration, claim 'Iraqi provenance, and I think we should not go very far astray in attributing them to a very ancient stock, which may have come down here either at the time of the Diaspora or from 'Iraq in pre-Islamic days. I hope that the Hebrew inscriptions I have collected may throw some light on the matter, but I rather expect they will prove to be of recent date. It is at any rate a very significant fact that this small community of Jews should have survived through the centuries in a corner of Arabia inhabited by Arabs of a most fanatical and turbulent character. The reason is not far to seek. They form a very useful economic element in the population. All branches of the smith's trade are their exclusive speciality. They were indeed more prosperous when the country was less restful than they are now under the Wahhabi peace. Some of them told me they would like to go to Palestine, and I invited them to listen in on my radio to the daily bulletins broadcast from Jerusalem during the troubles of last year. I think they then thought it would be advisable to postpone their exodus from the peaceful land of their exile. But I was a little surprised to find that, though they habitually speak Hebrew among themselves, they could understand the Arabic better than the Hebrew broadcast, which they dismissed, a little contemptuously, as Ashkenazi.

(*To be concluded*)

DISCUSSION ON THE GEOGRAPHICAL DISTRIBUTION OF INDUSTRY

Afternoon Meeting of the Society, 16 May 1938

THE DEPUTY PRESIDENT (Professor KENNETH MASON): It is natural that a subject such as the geographical distribution of industry should concern us as geographers and there are, of course, a great number of young geographers in the country who take much interest in it. The discussion this afternoon has been arranged largely by Professor Taylor to take different aspects from different speakers. We hope at the end of her paper to have additional contributions which will be of value in the final compilation of the evidence which will go eventually before the Royal Commission. As we have a number of speakers I will at once call upon Professor Taylor to open the discussion.

Professor E. G. R. TAYLOR: About six months ago this Society was asked to assist the Royal Commission which is now sitting to collect evidence on the geographical distribution of industry and the industrial population, by preparing for it a memorandum on the relevant geographical factors. The Council having delegated the task to a Committee of Fellows, and the Committee being assisted by a number of voluntary workers from the University Departments of Geography, a series of maps was drawn which during the last fortnight has been exhibited in the Ambulatory. The discussion upon these maps which is to take place this afternoon will form the basis of the memorandum which the Council of the Society will offer to the Commissioners. The maps themselves however are the essential part of the evidence, for they reveal relationships and suggest guiding principles which do not emerge from tables of statistics or verbal memoranda.

It is common ground that under the influence of a complex of historical and physical factors, the pattern of English industrial development began to take shape nearly a century and a half ago, and that a policy of free trade and laissez faire led to the sharpening and deepening of the outlines of that pattern until it came to be looked upon as stereotyped and final. It is common ground also that changes during the last twenty years, none of them strictly geographical, have rendered that pattern in some measure obsolete. The distribution of industry no longer fits the distribution of the industrial population, and we have "distressed areas" and lop-sided urban growth. Putting the situation into geographical terms, we can say that, with the growth of economic nationalism, marginal or sea-board location has lost a considerable measure of its old importance. Hence areas that relied mainly on such a location for their prosperity are now distressed. This loss is in part balanced by the increased value of interior location, but only in so far as that interior location is nodal. Nodality has always carried with it a tendency to diversity, as opposed to specialization, in industry, and it is obvious that the chances of a diversified industrial centre being adversely affected at every point by economic and political changes are relatively slight. Hence while a Blackburn and a Bradford suffer, a Manchester and a Leeds hold their own, for their nodality has lent them diversity of activities and functions. Even a Newcastle escapes the

extreme distress of a Tyneside, and such examples could be multiplied. Two further points may be noted. Very many of the new industries that have sprung up in the last twenty years have sprung up strictly in relation to the home market. Clearly they are most scientifically located at interior nodal points. Then again, one of the most striking features revealed by the new occupational statistics is the marked increase in the proportion of the population finding work in what may be termed the "services"—transport, public utilities, retail trade—as opposed to the manufacturing industries. Such "services," and therefore such opportunities of employment, are also at a maximum at nodal points, of which, of course, London is the extreme example.

The fundamental question that must be decided is whether industry is to be forced or cajoled back into the old pattern, or whether the industrial population is to be assisted to adjust itself to the new. With that problem however we as geographers have nothing to do. These preliminary remarks serve to indicate why so many of our maps deal with the facts of accessibility from one point of the country to another.

The first map (Fig. 1, see folding plate) shows surface relief: a basic geographical relief. Not only is about 15 per cent. of the land surface of England and Wales unsuitable to industry because it is too high or too steep or too broken, and because it carries too scanty a population to afford a labour supply, but these upland areas hinder access to areas lying behind them, as very notably to West Cumberland and to West Wales. The second map (Fig. 2) shows the actual distribution of the workers engaged in manufacturing industry according to the census of 1931. To bring it up to date we should have to add several symbols at Luton, Slough, and West London, as also at Birmingham, Coventry, and Corby, while subtracting a number from the textile centres; but so far as the general pattern goes the map would still present the same features. There is a small general scatter, but much more striking are the great concentrations. Moreover there is a belt of such high concentration, following an axis aligned from south-east to north-west, and broadening as it gets farther from Greater London. At either extremity of this belt are the sea-entries which dominate England's external trade relations: the Port of London, and Liverpool–Manchester, together handling two-thirds of the total imports and exports. Southampton and Hull, though they exist mainly to serve this axial belt, are separated from it by 40 or 50 miles of non-industrial farming country. Their much smaller trade totals however bring the figure up to three-fourths of the external trade of England and Wales as being closely related to this belt. In Fig 3, the unemployed in all categories (not merely manufactures) are shown according to the 1931 census.

The next map (Fig. 4) relates the industrial population in the narrow sense to the other great occupational groups. It is assumed that where approximately 30 per cent. or more of the working population are engaged in a particular group of industries, whether in factories, in mines, or in the fields, this will give a particular interest, a particular outlook or tone to the neighbourhood. The map shows that, contrary to general belief, the million or so agricultural workers still give its tone to a preponderating area of the country, and that, again contrary to general belief, the manufacturing and the mining

communities are in the main distinct, and the latter are tending to shift into more rural areas as larger and deeper mines are opened up in the "concealed" coalfields. The way in which, over so large an area round London, agricultural interest has yielded place to interest in the provision of residential amenities is remarkable, and nowhere in the whole country is there so continuous a belt devoted to residence and recreation as along the south coast, where, of course, the service group of occupations take a high place. It was thought proper to add the "Welsh line" to this map, as from quite another standpoint it denotes a cleavage in habit, outlook, and interest of which the national planner must take notice.

The next map (Fig. 5) is a confession of ignorance. The Chairman of the Royal Commission preferred a request for a map showing the fertility of the soil, but since a soil survey of this country has never been made, despite its fundamental importance, it was only possible to epitomize the information contained in the Oxford Agricultural Atlas, and thus indicate the areas where fundamental foodstuffs—bread, milk, sugar, potatoes—are most intensively produced. The disastrous encroachment of built-up areas upon, for example, our finest market-gardening soils in Middlesex and Essex has been discussed elsewhere. The completely built-up areas, which may be estimated at two million acres, are shown on this map, together with the areas normally too elevated for the plough. The latter provide rough grazing, or serve as catchment areas for our water supply. It is from the lowlands that thousands of acres are being abstracted yearly for spreading suburban settlement.

The map (Fig. 6) showing densely peopled areas (200 and more to the square mile), further emphasizes the special character of the axial belt referred to, and can be used negatively to pick out the areas where a "pool of labour" is absent; this I will refer to again presently. Meanwhile, since government control of the location of industry is obviously coming, we have prepared a set of climatic maps to add to those more commonly available. Fog (Fig. 7), overcast skies, and sunshine—even hours of daylight, vary more widely over England and Wales than is commonly realized. Health, comfort, cleanliness, as well as the lighting bill, are considerations which should make these maps repay study in choosing a factory location. Nevertheless, as the world is at present, the fog and cloud canopies are not without their strategic and protective aspects.

In general, a movement of industry into the drier and sunnier regions (Fig. 8) would be a movement eastwards and southwards: a movement which the map of agricultural use would suggest as undesirable. In the case of the extractive industries however location is dictated within very narrow limits by geological structure, and the association of low grade iron-ores (which will not bear the cost of transport) with the outcrop of Jurassic rocks has brought the heavy iron and steel industries eastwards into rural Northamptonshire and north Lincolnshire. The next map (not reproduced), showing in combination the coal mines and the iron and steel works, indicates elements in the industrial pattern outside the reach of the planner.

I now come to the group of accessibility maps, of which the first and simplest (Fig. 9) was drawn to correct the view, which has been authoritatively stated, that so far as transport is concerned, industry could be satisfactorily

located in any part of England and Wales. The next set of maps started from the assumption that if industry was compulsorily decentralized, there would still be the necessity to keep in close touch with a populous centre, where such business as banking, insurance, marketing, and so on, must necessarily remain. Business visits by rail from headquarters to the provincial factory and vice versa are essential, and areas were delimited around each of our great cities, not in accordance with the fastest train journey to each, but on the basis of train connections both to and from the centre giving ample time for holding a business conference in business hours and returning the same day. The resulting maps (Figs. 10–15) bring out very plainly that accessibility bears little relation to distance, while it does appear to have a very distinct relation to prosperity. The textile towns of the South Pennines and the greater part of Wales are among areas poorly accessible from London. Leeds is excellently placed in respect to a great part of the industrial north, while Liverpool's position, like that of Newcastle, is relatively poor. Manchester presents a somewhat similar picture to Leeds. Swansea lacks nodality almost completely and so afforded no map, while on the other hand the belt which has first-class accessibility to and from Birmingham is almost exactly coincident with the axial industrial belt already emphasized.

Accessibility by road is more difficult to define. The next map (Fig. 16) shows the pattern of "A" roads, among which "national" roads are distinguished. The upland belts which have considerably affected the pattern are also shown on the map, and among the points brought out is the geographical accident of the gaps through the Pennines which contribute to the superior nodality of and accessibility to Leeds. An attempt has been made to indicate the duration of snow cover on the many important roads which are forced to cross the Pennines and the Welsh uplands.[1] Although heavy lorry traffic and rail traffic are rarely completely interrupted by snow, the same is not true for the business man's small car, and the point is of real importance in considering relative accessibility. So far as the general pattern is concerned, the axial belt is again prominent, while transverse routes are far apart. London opposes a barrier between south-east England and the Midlands which it becomes increasingly difficult to negotiate, while the estuarine barriers of the Humber, the Severn, and to a less extent Morecambe Bay, are to be noted as seriously reducing the accessibility of the areas beyond them.

The last map (Fig. 17) affords an indication of the method by which the whole series may be used. It is constructed on what I have termed the sieve method. One by one features rendering areas unsuitable for industry are marked off in black on the same outline: in this case areas unsuitable because of their surface relief, areas unsuitable because of their scanty population, and areas unsuitable because of their poor accessibility from any nodal city are sifted out. It does not of course follow that the residual white area which has passed through these sieves is everywhere suited to the controlled or compulsory location of industry. Areas devoted to residential and recreational purposes, and areas where industrial expansion would encroach on agricultural land of exceptional importance should also be sieved out; but working

[1] A more detailed map, prepared by Mr. Gordon Manley, was on exhibition in the Ambulatory.

on the 1/M scale such finer discrimination is impossible, and can more conveniently be carried out when a particular region is under discussion. Even without this finer sifting, it is remarkable how extensive is the area to which industry could not wisely be transferred without a migration of population (involving provision of housing, schools, and so on) or an improvement of access, or both. In South Wales on the other hand it can be seen that, while

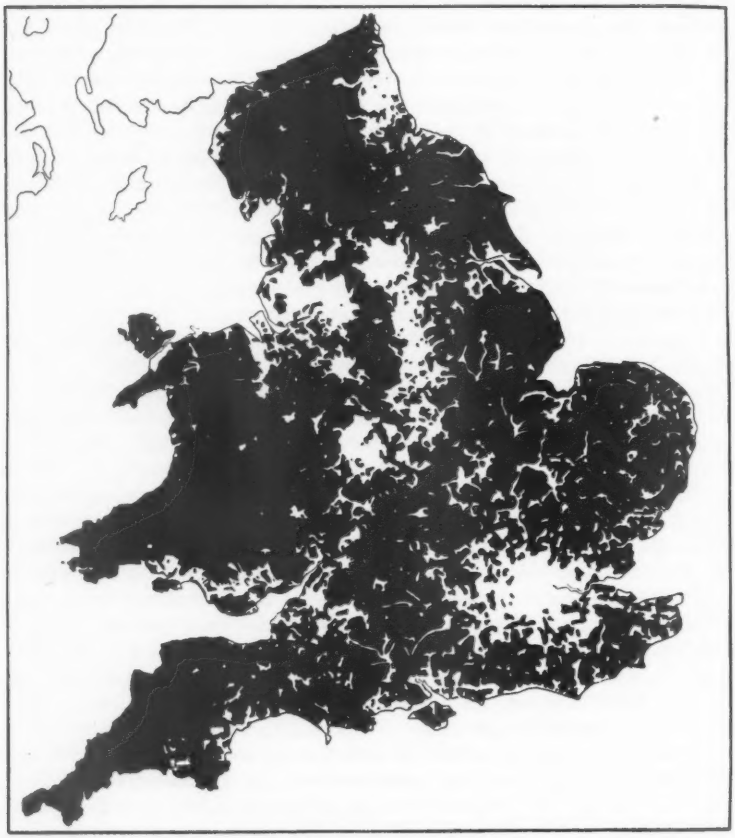


Fig. 17. Areas, in black, delimited by the sieve method as unsuited to industry under existing conditions

the Vale of Glamorgan is prominent, the narrow thronged valleys near the northern rim of the coal basin are sieved out by their surface configuration as well as by their poor accessibility. Our older mining areas, perhaps above all others, present the most difficult problems to the planner.

Such a brief survey does not exhaust the interest and the lessons of our maps, but it is sufficient, perhaps, to convince you that a study of such national

maps should form a useful, if not indeed an essential preliminary to any national planning that may be under consideration.

Mr. G. H. J. DAYSH: This contribution deals with some facts related to the first part of the Royal Commission's terms of reference: "to enquire into the causes which have influenced the present geographical distribution of the industrial population of Great Britain and the probable direction of any change of that distribution in the future."

In the November 1937 issue of the *Ministry of Labour Gazette* statistics were published to show changes between July 1923 and July 1937 in the estimated number of insured workpeople (excluding juveniles under sixteen years of age and agricultural workers) in certain industries in Great Britain and Ireland. In July 1923 there were 11·4 million persons insured in all industries and services, whereas in July 1937 the figure was 13·6 million. While there has been this increase, changes have occurred in the relative proportions of the total insured population in large groups of industries, and they are reflected in the summary made from a table in the above Gazette.

TABLE I—RELATIVE PROPORTIONS OF THE TOTAL INSURED POPULATION INCLUDED IN CERTAIN LARGE GROUPS OF INDUSTRIES IN 1923 AND 1937

Group	*Percentage of total number insured at*	
	July 1923	*July* 1937
Fishing[1]	0·2	0·3
Mining and quarrying	11·7	7·1
Manufacturing	51·1	47·1
Building and contracting	7·3	9·7
Gas, water and electricity supply[2]	1·5	1·6
Transport, communication, storage, and distribution[2]	17·8	21·7
Commerce, banking, insurance and finance	2·0	2·0
Miscellaneous services (including professional services; entertainments, sports; hotel, public house, restaurant, boarding house, club, etc. services; laundries, dyeing, and dry cleaning)	4·7	6·7
National and local Government	3·7	3·8

[1] The figures for the fishing industry do not include shore fishermen outside the scope of the scheme.

[2] The figures are exclusive of considerable number of persons excepted from unemployment insurance under certificates of exception.

I will refer briefly to the coal mining section of the second group, and rather more fully to the metal industries of the Manufacturing Group as a preface to the rest of my contribution.

Over the period 1923–37 the number of insured persons in Great Britain classified as attached to the coal mining industry decreased from 1·2 million to 0·8 million. There has of course been transference from coal mining to other groups, more particularly to building and public works contracting. On 18 October 1937 however there were in Great Britain 83,485 wholly unemployed and 29,960 temporarily stopped among those insured in coal mining. Approximately 62 per cent. of those permanently unemployed were located in Wales (with Monmouth), Scotland, and Northumberland

and Durham. The location of these areas in regard to the axial belt which Professor Taylor has defined will be noted. In all these areas the coal mining industry occupies an outstanding position in employment groups as a whole and in 1931, in County Durham, for instance, nearly 29 per cent. of all those employed, male and female, were in the coal mining group.

The association of metal trades with coalfields is characteristic of this country, and with the adjustments of the recent period, changes in the location and importance of branches of the metal trades have been observed. The coalfields are in large part without iron ore and even the acid-steel and pig iron works of Cumberland, operating close to local hematite ore, import foreign ores. Changes in technical processes have increased the use of comparatively low quality ironstones, and it has been found economically possible to establish steel works away from coalfields. Such changes, important in themselves, have not unduly disturbed the relationships of the several categories in the metal industries group, which are represented in a series of maps based upon calculations made by Mr. A. A. L. Caesar. These basic-steel developments are very significant to the acid-steel industry of West Cumberland and Furness, markedly dependent upon mining coal and hematite iron, and producing pig iron and steel.

The category "Manufacture of metals, machines, implements, conveyances, jewellery, watches" employed a total of 1·7 million persons aged fourteen and upwards in England and Wales according to the Industry Tables of 1931, *i.e.* some 10 per cent. of the total of persons employed in all industries at that date. Within the category the three sub-categories of engineering (not marine or electrical), electrical installations, cables and apparatus, and the construction and repair of vehicles employed over 50 per cent. of the total. The last two of these have shown a considerable increase in the number of insured workers attached to them over the period 1923–37.

Examining by counties the employed percentages of the total in this category, one observes that the five counties in Table II together employ 52½ per cent. of the total, and their percentages of the totals employed in England and Wales in the ten sub-categories are:

TABLE II—DISTRIBUTION OF EMPLOYMENT PERCENTAGES IN THE CATEGORY OF METALS, MACHINES, IMPLEMENTS, CONVEYANCES, JEWELLERY, AND WATCHES

	Tot.	1	2	3	4	5	6	7	8	9	10
Warwick	13	¼	7¼	14¼	6¼	12¼	23	—	14¼	18½	3¼
Lancaster	12	7¾	19¾	8¼	17¾	17¼	8¼	14¾	2½	10	4¾
Yorkshire W. ..	10½	32¾	2¾	9¾	11¼	3½	5	¾	53¼	8	20
London Adm. Cty...	8¾	¼	12¼	3½	10¼	16¾	7	2½	4	12	14
Stafford	8¼	9¼	6¼	15¼	3¼	4¼	6	—	5¾	19¼	3¼

1. Smelting, converting, refining and rolling of iron and steel.
2. Extracting and refining of other metals and alloys.
3. Founding and other secondary processes in metal working.
4. Engineering (not marine or electrical).
5. Electrical installations, cables, and apparatus.
6. Construction and repair of vehicles.
7. Shipbuilding and repairing; marine engineering.
8. Cutlery and small tools (not machine tools).
9. Other metal industries (not precious metals, jewellery, or plate).
10. Precious metals, jewellery, plate.

In these counties, whose location will be observed, there is some balance of employment in the sub-categories, in contrast with other counties, as

	Tot.	1	2	3	4	5	6	7	8	9	10
Cumberland ..	½	2¾	¼	¼	¼	—	¼	¼	—	¼	¼
Durham	3	6¼	4½	2½	3¼	¼	1	12½	¼	1¼	½
Northumberland ..	1¾	¼	2	¾	2	1	½	11¼	¼	¾	½
Hampshire	2	—	¼	½	1¼	1½	2¼	15¾	—	¼	1
Glamorgan	2¼	5½	19¾	8½	¾	¾	1	2¼	—	1	½

Cumberland concentrates on 1, Durham largely on 1 and 7, Northumberland and Hampshire on 7, and Glamorgan on 2 and 3.

The concentration within one sub-category is still further emphasized when the part played by employment in the category as a whole is considered. In Durham for instance the numbers engaged in 1931 in the Metal Manufacture group (3 per cent. of the total for England and Wales) represented 11 per cent. of the total employed in all industries in the county, only exceeded by the mining and quarrying group (over 29 per cent. of the total) and by commerce and finance (15 per cent.). In 1931 about 40 per cent. of the total employed in industry were in two groups, the mining industry and the metal trades, the latter markedly specialized, whereas in the first five counties the balanced variety of the metal trades resembles that of all industries.

The heavy industries of this country have been affected recently by vital circumstances. Conditions in world trade have lessened their capacity for export upon which they largely depended. Thus in July 1937[1]:

Coal mining employed only	72·0 per cent.
Iron ore and ironstone mining	60·4
Pig iron (blast furnaces)	63·8
Steel smelting, etc.	89·3
Marine engineering	83·8
Shipbuilding and ship repairing	66·3

of the numbers employed in 1923. In 1923 these selected industries made up some 17 per cent. of the total insured in all industries and services, but in 1937 only 11 per cent. When unemployment figures are taken in it will be apparent that counties highly concentrated upon such industries are unhappily situated. Mechanization and rationalization have of course contributed to the unemployment brought about by reduced trade, and one result has been an outflow of population, familiar in such areas as the North-East Coast and South Wales.

In 1923 five heavy industries of Northumberland and Durham employed 60 per cent. of the total employed in all industries and services; in 1937 the percentage was 47. The total employed meanwhile had grown from 570,720 to 605,200. The significant gains in employment capacity were in the Building and Public Works Contracting group and in the distributive trades. These cannot be regarded as manufacturing industries and consequently the status of such coalfield areas, relying in the past upon primarily an export trade, has declined. This decrease in production has not been, as yet, compensated by

[1] *Ministry of Labour Gazette*, November 1937.

the introduction of any significant number of representatives of new or light industries.

Broadly speaking, the free trade policy of this country in the middle of last century encouraged many industries to choose localities suited to supply countries overseas. The acid-steel industry of West Cumberland, for example, had many advantages for such trade and the coalfield area of the North-East Coast was geographically well situated. Local facilities, *e.g.* river mouths, were improved and population accumulated, while much money was invested in such areas. The protectionist policy of 1931 stimulated the growth of lighter industry, whose market was essentially within this country. The growth of these light industries has been pronounced around London and in the Midlands. This was natural growth, since proximity to market, adequate transport, and suitable labour, with money available, are considered to be determining factors to a large degree. Certain industrial regions were bound to gain, just as others away from the main core of population were almost equally bound to suffer, unless special measures were introduced.

In brief then the present changes in the geographical distribution of the industrial population result primarily from Governmental policy, brought about by international circumstances. Earlier policies encouraged the extraction of coal and iron ore, and working the ore, in distinct localities. A more recent change in the growth of production and consumption abroad has been associated with changes in our national fiscal policy. The result has been a further stage in the age-old movement of population of this country as the employment capacity of certain industries has shrunk, as the balance of employment has changed. It has been demonstrated elsewhere that the growth of employment in productive industries has, as a whole, been far exceeded by growth of employment in service industries. But in some localities, for example in the Special Areas, the development has not counteracted the reduction in basic industries.. Consequently unemployment has been particularly marked, outward migration pronounced, and a wide set of problems produced. Present, probably temporary, circumstances have to some extent reduced these problems, but old-established industrial regions show even in a boom period a surplus of industrial population larger than normal. Special measures have been introduced whose effect can hardly yet be gauged.

Professor H. J. Fleure: A number of teachers and students of geography in industrial centres have been studying industrial locations and populations, especially with reference to recent changes, and some of the maps they have made are exhibited. Mr. Wilfred Smith of Liverpool will deal especially with South Lancashire and I have been asked to preface what he has to say by remarks on some general tendencies.

Among factors of change we may note first the economic crisis developing through various stages from 1913 to 1930 and the aggravation of the crisis since 1930 through the worsening of international relations. The economic crisis, acting through a decline in the volume of international trade, has affected the industrial regions of Britain unequally, those which developed during the Free Trade conditions of the nineteenth century a large export trade, whether in textiles, coal, steel, or ships, have suffered greatly, especially

Relief Map

Fig. 1

Land Use M

Fig. 5

Fig. 1

Fig. 2

Fig. 5

Fig. 6

Census of England & Wa
Occupational Tables : Distribution of Unem

Fig. 3

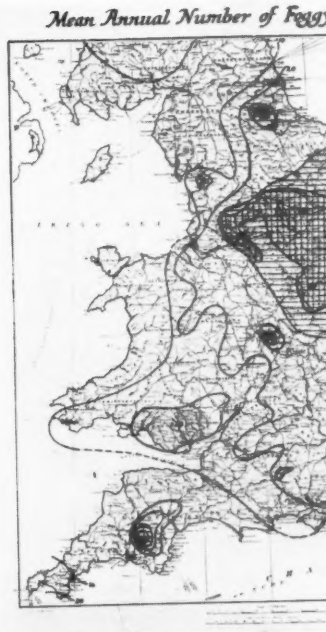

Mean Annual Number of Fog

Fig. 7

Fig. 3

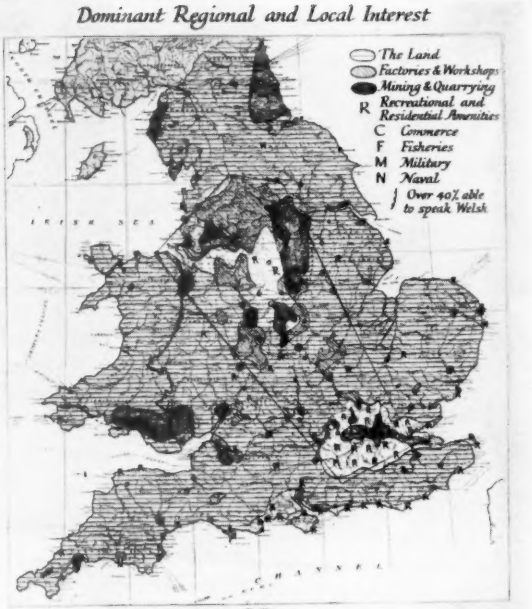


Fig. 4

Fig. 7

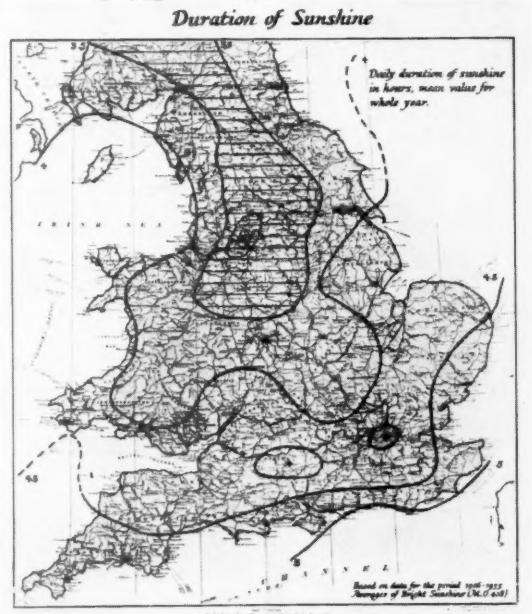


Fig. 8

Fig. 9

Fig. 13

g. 9

Fig. 10

. 13

Fig. 14

Two-way Accessibility by Rail

Fig. 11

Two-way Accessibility by Rail

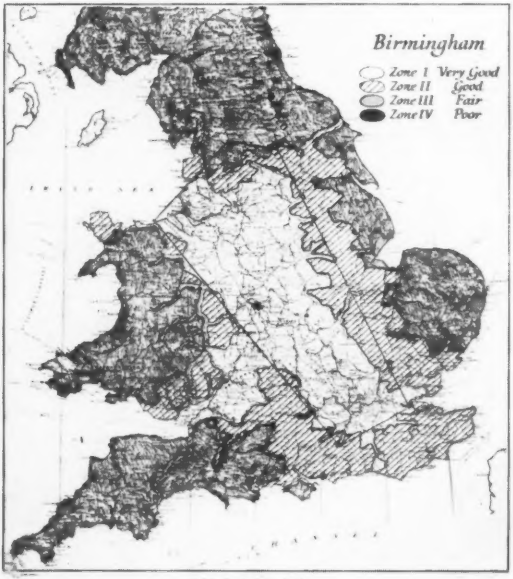


Fig. 15

Two-way Accessibility by Rail
Liverpool
Zone I Very Good
Zone II Good
Zone III Fair
Zone IV Poor

Fig. 12

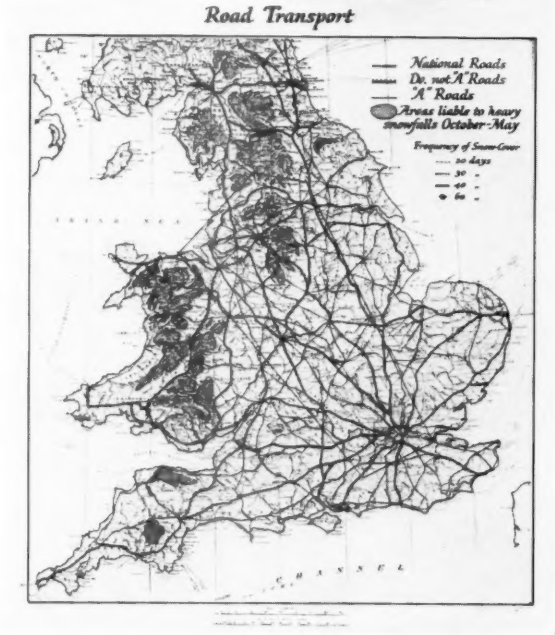

Road Transport
National Roads
Dr. not 'A' Roads
'A' Roads
Areas liable to heavy snowfalls October-May

Fig. 16

where they were concerned with the more commonplace goods. The decline in the exporting industries has altered the balance of our industrial economy and the balance of industrial distributions. International exchanges have been restricted, foreign investments lost, confidence reduced, and home-made substitutes have replaced imported goods in several countries. Particular objects, such as special fabrics in the textile trade made with special skill, taste, and enterprise, have been less affected, and this illustrates an increased importance of quality, provided it is combined with cheapness.

The Diesel engine and electric power have weakened the link that formerly bound industry to the coal pits and have contributed new opportunities of cleanliness and of installation of light industries near large populations, *e.g.* around London in clean rural areas.

The motor lorry and the cargo liner have altered the opportunities of transport, the former freeing industry from some of its previous dependence on railway sidings, the latter giving opportunities of despatch of goods from ports of call, notably Southampton.

Fiscal policy has encouraged the growth of light industries, which are tending to spread near various population centres, especially under conditions of cooperation in transport, workers' welfare, or accessories such as packing materials. This secondary growth may act to some extent as a civic insurance. Highly specialized localities have tended to suffer very seriously, unless their products involve very high-grade skill and experience.

Towns which depended on one industry were often over-developed under conditions of a generation ago and have a difficult heritage in consequence. Towns of more moderate size, if they have had various smaller industries, often grew less ambitiously and have weathered the troubles, thus far, rather better. In many cases the rapid accumulation of inventions has involved large losses of capital and supersession of factories, especially those formerly built near canals running through town centres, where traffic problems have become so complex since the motor lorry came in.

In spite of the motor lorry and electric power however industry seems likely to remain to a large extent in the north and in the London-Preston-Leeds belt that Professor Taylor has emphasized. One factor is the inter-relation of industries, some using mainly male, others a large amount of female, labour, several using as raw materials the finished products of others. Another factor is that the types of people among us who can stand industrial conditions are often those who dislike moving to an unfamiliar kind of environment. Transplantation is only rarely successful.

Mr. WILFRED SMITH: I have been asked to summarize the results of a detailed inquiry into the changes in the distribution of industry within South Lancashire as a sample of work that is being done in many regional centres. Of its three major productive industries, cotton is highly localized in South Lancashire while it has coal-mining and engineering in common with other industrial regions. I will deal very briefly with cotton spinning and weaving and with coal-mining, leaving engineering aside for the present.

The trends in cotton, which are very complex, may be summarized as follows:

The geographical separation of spinning and weaving is becoming more

and more complete. Fully 90 per cent. of all spindles are in south-east Lancashire, south of Rossendale, but weaving has a wider scatter, 74 per cent. of looms being in and north of Rossendale (1936).

There is a change in the balance of distribution as between urban and rural areas. The changes are least in spinning, which remains a chiefly urban industry, and the average size of spinning mills has increased from 75,390 in 1913 to 94,469 mule equivalent spindles in 1936 (1 mule spindle=1; 1 ring spindle=$1\frac{1}{2}$). Weaving however, already a village as well as a town industry, is becoming less urban. The number of looms in the Boroughs, County and Municipal, was in 1936 only 60 per cent. of what it had been in 1913, but in the Urban and Rural Districts it was 77 per cent. The average size of weaving sheds has increased but little (641 looms in 1913, 677 in 1936). These calculations of size refer to premises and not to firms.

In their reactions to the catastrophic decline of the export trade, there has been a greater reduction of plant in the districts producing the coarser than in those producing the finer yarns and piece-goods. In the Oldham district, spinning coarse and medium counts, the number of spindles in 1936 was reduced to 66 per cent. of the number in 1929; while at Bolton and Leigh, spinning fine counts, the number in 1936 was 95 per cent. and 98 per cent. respectively. At Blackburn, Accrington, and Darwen, making the cheaper cloths (*e.g.* dhooties for the India trade), the number of looms in 1936 was as low as 57 per cent. of the number in 1929; while at Burnley, Nelson, and Colne, making the higher-priced cloths, the number of looms in 1936 was 75 per cent.

There are changes in geographical distribution due to the operation of wage lists over a long term of years. Wage lists are the schedules under which an operative is paid for his or her work and their effects have been analysed by the Economics Research Section of the University of Manchester. The Blackburn and Hyde Lists, for example, are held to be partly responsible for the progressive decline in the spindleage of those districts, and the Oldham List for the progressive increase in the spindleage of that district until it was involved in the post-war economic crisis.

The trends in the geographical distribution of coal-mining are diagrammatic in their clarity. The new pits (apart from small adit workings) and the pits with an increased number of men on their books are on the southern margins of the coalfield, where the exposed field passes into the concealed. It is a trend common to most coalfields. The average size of the colliery in Lancashire, as measured by the number of men on the colliery books, has changed but little. Position in the coalfield rather than size is the significant factor.

Of the maps exhibited in the Ambulatory, those of the West Midlands, the East Midlands, and West Yorkshire have been prepared by and under the supervision of Mr. A. W. McPherson, Mr. K. C. Edwards, and Mr. K. G. T. Clark respectively, and those of South Lancashire by Miss H. M. Lyon and myself. Similar work is being done by Mr. H. W. Ogden for Lancashire engineering industries, by Mr. Stedman Jones for North Wales, and by Dr. and Mrs. J. Thomas for North Staffordshire.

DISCUSSION

After Professor Taylor, Mr. Daysh, Professor Fleure, and Mr. Wilfred Smith had read the papers printed above, the following speakers contributed.

The DEPUTY PRESIDENT: Two communications have been sent in by Fellows of the Society who unfortunately were unable to attend. I will ask the Secretary to read them both. The first is from Dr. Dudley Stamp, who from the start has taken much interest in the Commission, and the second is from Mr. Gordon Manley.

Dr. L. DUDLEY STAMP: Five months' absence in the Far East has prevented me from taking the active part in this investigation that I should have liked, and to-day I am prevented by illness from being present at the discussion. In the first place I should like to congratulate my colleagues, especially Professor Taylor, on the fruitful results of their labours.

The maps appear to me to indicate very efficiently the operation of the three groups of factors which have determined the present distribution of industry and land utilization in Britain: the natural or geographical factors, the historical factors, and the more purely economic or social.

The natural factors of physiography, geology, climate, and soil are permanent, and may be isolated and studied intensively *per se*. Thus Fig. 1 shows the unalterable physical relief, but the influence of that relief on human activity alters from generation to generation. At first sight it seems that man is gradually emancipating himself from the controlling influence of the physical factors, whereas in reality the reverse is the case. In the old days the proximity of iron ore and wood for charcoal (later coal) concentrated an iron industry in the unsuitable narrow valleys of South Wales; swiftly running streams to operate the forge-bellows and the grindstones held the early cutlery industry in the narrow valleys above Sheffield. Released in modern times from these more immediate controls, the industries have naturally migrated to locations more accessible and with more space for expansion and growth. Professor Taylor's areas of unfavourable relief have asserted their importance; they are in the long run unsuitable for the location of industry. The struggle becomes one for the possession of the best stretches of land the country can offer.

The historical factors often tend to oppose the geographical. A location becomes unsuitable geographically for a particular industry—*e.g.* through the exhaustion of raw material as in the iron-smelting industry of the Black Country—but the historical association of the industry with the locality, and the predilection of the human population for occupation in that industry, result in efforts being made to stem the influence of the geographical factors and maintain the industry by artificial, usually uneconomic, means; as for example by bringing in the necessary raw materials. Successful cases of this sort have generally been due to a progressive evolution or change in the industries concerned, *e.g.* from heavy to light metal industries in the Black Country.

Thus the general movement of industry is not merely away from the unfavoured areas shown in the maps but definitely towards areas where all, or as many as possible, of the factors are favourable; where there are wide stretches of land flat or gently undulating (for lateral expansion of modern factories with a horizontal lay-out), well drained, readily accessible by road, rail, and water, and in easy touch with the bulk of the consuming population and with the foci of finance and commerce.

It is here precisely that industry comes into competition with the other claimants to the land, notably the agriculturalist. It is precisely the accessible, well-drained, flat or undulating land so suitable for factory or housing estate

development that is also most suited for the production of fresh fruit and vegetables so urgently needed for the nation's health. National fitness depends primarily on food. Yet probably only 5 per cent. of the surface of Britain is suitable for intensive market gardening and the production of the right types of food. It is this 5 per cent. which is being eaten up by industry.

If the growth of industry is to be controlled in any way, it must be in strict relation to the nation's resources of good land. The land use must be planned as a whole, the claims of industry and agriculture being carefully balanced.

Mr. GORDON MANLEY: As I am to a considerable degree responsible for estimates with regard to snow-cover I should like to say that the snow hazard, where it exists, could in my opinion be largely overcome by a re-alignment of certain upland roads and the adoption of Norwegian methods of checking drift. The difficulties due to icy hills should however not be forgotten; I am in full agreement with Professor Taylor's remarks about the effects of snow upon accessibility; and also upon the advantages of Leeds in regard to Northern England.

The indirect influence of other climatic factors on the future location of industry should not be overlooked. The immediate facilities afforded for consumption-goods industry may be equally good in a number of areas, "special" or otherwise; the available amenities, and particularly general impressions of climate (which may, or may not, be correct) are one of the more subtle factors which will play a part in future if unrestrained choice of location is allowed to prevail. The comparatively clean and bright southern centres attract many, despite their somewhat gimcrack appearance; in time to come there may well be a growth of minor industries near the sunny and low-rated Lancashire coast in similar proximity to a large market and a willing labour supply. There are already many signs of a movement from the Pennines, which, while influenced by transport facilities, may not be entirely unrelated to the exceptional deficiency of bright sunshine indicated by the Manchester and Burnley records. It is worthy of remark that study of the frequency of rainfall, rather than the amount, reveals much less difference between upland and lowland stations than is commonly believed.

Clearance of derelict nineteenth-century industrial sites has been recommended with good effect in the Special Areas, and clearance of outmoded nineteenth-century methods of coal combustion is also likely to prove effective in the conversion of major industrial aggregations, originally based on an export trade, into balanced urban communities of the type hinted at by Professor Fleure. Such towns should ultimately produce, under the stimulus of a varied, attractive, and vitalizing environment and long traditions of inventiveness, goods holding their export market by reason of their quality; and at the same time should be able to satisfy their own needs as consumers, with, to use an engineer's metaphor, the minimum of lost motion. The separation of heavy and light industries has led to dangers which are very apparent in the Special Areas, and which may develop elsewhere under some of the more subtle influences which I have tried to suggest.

With regard to accessibility, a study of railway time-tables suggests that the effective dormitory zone for active executives in provincial cities lies within little more than an hour's journey, a consideration which also governed the spacing of mediaeval market towns.

Brigadier M. N. MACLEOD: I can only contribute a few words with regard to the maps that have been prepared and which you have seen on the screen. They are not of course quite in their final form. Those in the Ambulatory were prepared in manuscript, and though they have been polished up to a considerable

extent by the Society's draughtsmen they can of course, by being fair drawn, be made rather more clear than they now are.

In order to use them in the sieve method which Professor Taylor has suggested, and which of course is the obvious way (each map illustrates one particular factor and all these factors have some influence on the distribution of industrial population), it is necessary to be able to compare one factor with another and two or three at the same time. The easiest way of doing that would be to make a drawing on some kind of tracing paper so that one, two, three, and if necessary more, tracings can be superimposed, one on top of the other over, say, a physical map of the country. In that way it will be possible to sieve out certain factors and to see at once what remains, and which particular factor rules out a particular area.

The difficulty is that it would necessitate much work by the draughtsman in preparing the drawings and would involve the Society in considerable expense. We have for that reason asked the Government to assist us. I do not think it would be appropriate for the Society to charge its own funds with work which, after all, is being done for the Government. A considerable amount of work is involved and though no doubt the maps as they stand would be useful, they are not in the most suitable form or in a form that can be considered final. That is our intention with regard to the maps; and if some of them are to be published I may mention that by drawing them separately on tracing paper the subsequent publication will be considerably facilitated.

Dr. SELWOOD: Professor Taylor's maps will be helpful for teaching purposes. They will allow us to classify communities according to their chief occupational purpose. For instance, one town is 60 per cent. in manufacturing terms; another 36 per cent. in personal service terms. It will now be possible to group towns of similar occupational mode of thought instead of insisting upon the isolated features which we so often have to put before children in class. We shall be enabled to answer such questions as "What is a mining town?" "What is a fishing town?" "What is a craft town?" The work is still in progress under Professor Taylor's direction and later on we shall be able to put the results forward.

Mr. L. C. W. BONACINA: I only desire to speak because Mr. Manley, who has been indefatigable in preparing the maps showing the liability to road obstruction by snow, has not been able to be present. I have merely been able to offer a little advice in the background. I take it that he has used the 1000-foot contour, roughly, as showing the area liable to heavy snowfalls, and I would like to point out that should the climate take a very moderate turn in the colder direction that area would be disproportionately increased. There is no doubt that the very critical level for snowfall in this country is 500 feet above sea-level, and as about half the area of England and three-quarters the area of both Scotland and Wales is above that level, you will realize that the factor is not to be disregarded. Should the problem in connection with modern road transport ever become urgent, it would have to be studied in relation to the phenomenon of snow drift. Snow does not need to be at polar temperatures to travel great distances across country. I have been collecting evidence which goes to show that much snow finds its way to the lower country in the lee of high ground owing to drift. But for the wind it would remain on the high ground; and if it so happens that stretches of road lie in that critical position, there will of course be great accumulations of snow.

Dr. H. C. K. HENDERSON: There are only two points I would like to emphasize. Dr. Dudley Stamp has already emphasized one in his communication, namely, that we should be careful to preserve the better land for cultivation purposes,

but that at the same time that land is very frequently the most acceptable from the industrialist's point of view. In that sense the economist clashes with the geographer. The economist tends to think of land value purely from the cash point of view; the geographer thinks also in terms of the food supply.

Secondly, there is the question of skilled labour to which Mr. Daysh referred. It has occurred to me—I have not had time to work it out from the census—that the present accumulation of new industries in the Birmingham area and in the London district is largely dependent upon the existence of a variety of skilled labour. If we refer to Mr. Daysh's contribution we shall see that there was a marked concentration of steel activities in the north-east. To a large extent steel is produced in the north-east by labour not altogether suited to the production of, say, wireless terminals and such commodities. In London and perhaps in the Midlands there is the widest range of occupational groups anywhere in the country.

As regards other parts of the country I have not finished working out the number of the official occupation categories represented, but in London only one such category was unrepresented in the last census. I do not think you would find this to hold true in the North-East or in South Wales.

Dr. E. C. WILLATTS: I wish to emphasize a point that has been mentioned previously, the question of land fertility. Mention has been made of fertile arable land, of which the most productive is that devoted to market gardening. As Dr. Dudley Stamp pointed out, only about 4 or 5 per cent. of the country is suited to that, and perhaps only 2 per cent. is actually used for market gardening. We may reasonably expect that very soon all such land will be used for food production, but when one goes beyond that 4 or 5 per cent. there is still a great deal more land which should be safeguarded from the ravages of industry, which does not utilize the soil for productive purposes in any way. I would put in a plea for some attention not only to arable land, but to grassland. There are stretches of grassland which are more productive than much of the arable land which tends to catch the eye.

I do not think Professor Taylor would in any way disagree with me when I say that I think we could produce rather more detailed information than has been summarized in the land-use map now on exhibition. It would be possible, as a result of the work which has been and is still being carried on by the Land Utilization Survey, to delimit certain areas where the soil is of great value and might well be preserved. Such a delimitation at present lacks support by any Government soil survey, but I think we have sufficient information to be of assistance to geographers and perhaps also to the Royal Commission.

Mr. LEONARD BROOKS: First, I should like to compliment Professor Taylor on the first-rate set of maps we have seen. She has given us all a lesson in expressing geographical factors in the geographer's characteristic way, which is the map. I hope that the maps will be finished off by the draughtsmen, as has been suggested; but even as they are, they are excellent, and as I am chiefly concerned with schools and education I should like some seven of them to be available for use in teaching. They are maps that tell their own story.

I would like to say a few words with regard to the special position of London. London is, of course, a centre of government and finance, and as a great port and distributing centre has for generations drawn people from all the rest of the country. Since 1921 this has been proceeding at a more rapid rate than previously. To-day in Greater London there are about $8\frac{1}{2}$ million people, or one-fifth of the population of England and Wales. In the table that Mr. Daysh put on the screen only the administrative county was covered, but in considering London, one has to take not the administrative county but Greater London:

only a mile or two from here one side of the Edgware Road is Middlesex and the other London, though it is one geographical area. Greater London has grown tremendously as an industrial area and I confess, as a Lancashire man, I have been rather jealous, but I do not see how it could have been avoided.

Greater London has to-day rather more than one-fifth of all the factories and workshops of England and Wales. It is often said that this has been largely achieved by the transference of industries from other parts of England to London. That is not true. The transfers of industry that have taken place have been mainly from inner London to outer London. But it is true that a high proportion of the new industries that have been started in this country have established themselves in Greater London. We have seen from the maps what those categories are: mainly the motor industry, electric cables and lamps, and electrical engineering. I think Dr. Henderson was right when he said that the growth of industry in London is partly due to the great variety of skill there is in the London area. But even to-day in Greater London to a large extent it is the old-established London industries that have been developed—printing, clothing, furniture, leather, and miscellaneous industries supplying luxury products.

The industrial development of Greater London is the result of a combination of social and economic conditions and of personal preferences. I said a moment ago that London has not expanded by the transfer of industries from other parts of Britain. Nor do I think that the introduction of a system of control would have deflected many of Greater London's new industries to other parts of the country. But I do think that control within Greater London would make for a much better state of affairs than obtains to-day. If the Royal Commission can do that, they will do a very great service. Thirty-five years ago the inhabitant of inner London was only 2 or 3 miles away from rural amenities. To-day, even with increased methods of transport and better travelling conditions, he is often anything from 10 to 15 miles away. We all know in London what rush hours mean, but with London as it is to-day I do not see how we can avoid that. To-day many people in inner London seldom get out to the country simply because of the fatigue involved in getting there. Many of those who have gone to live in the new housing estates in outer London find that after a hard day's work the benefits obtained by living in the country are largely diminished by the disadvantages of getting there.

It is amazing what little experience of the country many of the people of inner London have. I was with a party of forty-two girls, forming a top class from a North Kensington school not very far from this hall, when they were in the Isle of Wight on a school journey. Half of them had never seen the sea until that day. Some of them had never seen a live cow. If life in Greater London is to be satisfactory for its workers Government action in the direction of industrial town planning is urgently desirable. There are far too many local authorities in the London area dealing with town planning. It is the considered opinion of many that London has grown as big as it ought to. It may be possible to stop it, but I doubt it. But to attempt any solution of present difficulties by the diversion of industries now in London to other parts of the country would be foolish, for it would only tend to produce distressed areas in the capital city, even if it meant improvements elsewhere. In fact, the prosperity of Greater London has been a very great advantage to distressed areas in other parts of the country.

I could not help noticing when the maps were being shown that one fact stood out very clearly: namely, that Birmingham ought to be the capital of England, not London, because Birmingham would appear to be in a better

position. But being good geographers, I hope we do not think that geography explains human activities; and in any case I think it much too late to make a change now, even if it were desirable—and it is not.

Mr. S. BEAVER: South Wales has been rather neglected by the speakers this afternoon, mainly because they are more interested in other areas. I would like to say a word or two about South Wales, in particular in connection with one point Professor Taylor made. I would suggest that South Wales falls quite naturally into four industrial regions. First, the area which lies in the north-eastern portion of the coalfield, stretching from Aberdare through Merthyr Tydfil, Ebbw Vale, and Blaenavon to Pontypool; this might be called the old derelict iron and steel area. The second industrial region focusses upon the Rhondda Valley and its associates in the centre of the coalfield, and is a special or depressed area for entirely another reason.

The first area I mentioned is depressed for the simple reason that its ironstone is worked out and it has comparatively little coal left. The coal mining has migrated down the valleys; it is 20 miles inland and most of it is 1000 feet above sea-level. It is precisely in one of those valleys, Ebbw Vale, that one of the greatest iron and steel companies of recent years have spent over £4,000,000 on entirely new iron and steel works. Ebbw Vale is practically 900 feet above sea-level, and about 20 miles inland from the nearest port. They are now hoping to manufacture a vast quantity of iron and steel by using iron ore of a low grade, 25 or 30 per cent., from Northamptonshire, 150 miles away, or by importing richer foreign ores through Cardiff or Newport. They have actually started doing this. What will happen when the next depression comes I am not certain. Ebbw Vale appeared on Professor Taylor's maps as one of the prohibited areas in which industries should not be set up, because of inaccessibility.

The reason for the setting up of the Ebbw Vale works is no doubt partly sociological: the existence of an area where there had once been iron works, with a large agglomeration of population which at one time had been working in the iron and steel industry. But when the company some half-dozen years ago threatened to move the greater part of their South Wales plant to North Lincolnshire, which is the most natural centre for steel-making in the whole of this country at the present day, there was such a tremendous outcry in South Wales that they were virtually forced by pressure of public opinion to abandon the idea and they set up their works at Ebbw Vale.

The second region, the Rhondda Valley, a coal-mining region, is depressed for the simple reason that though there is abundant coal there nobody wants it; the particular variety of coal being "Admiralty Large" steam-producing coal which none of the world's fleets, either merchant or naval, now desires to any great extent. There the elevation is lower, and not quite perhaps so cramped a space as in some of the north-eastern regions; and in that valley there is more possibility of establishing the new lighter industries because coal-mining is bound to continue on a smaller scale. The coal is there and we shall always want coal. Why not therefore set up a few new industries which can keep at work parts of the population not actually engaged in mining? It should be borne in mind that the lighter industries provide work, generally speaking, for the female portion of the population who are not provided for in coal-mining industries. That is one of their great advantages.

The third industrial region of South Wales is the anthracite mining region, less depressed perhaps than the others, a region which must inevitably be almost entirely dependent upon anthracite mining, but in which there is a combination of agriculture and mining. Lighter industries might be set up there perhaps,

but the combination of agriculture and mining is sufficient to prevent such an area from falling too far into the depths of depression.

The last area from some points of view very greatly resembles the Midlands area, except in accessibility. I am sorry Professor Taylor should have spoken of the hopeless inaccessibility of the Swansea region, because it is the only area of South Wales, apart from Cardiff and Newport, for which there is any economic hope whatever. The reason is that Swansea, like Birmingham, is diversified. Swansea is the metropolis of the South Wales steel and tin-plate industry. There are remnants also of the once famous non-ferrous industries, smelting zinc and nickel and refining copper. And lastly, there is the export trade in anthracite, focusing naturally on the best port of the region, which is Swansea. The Swansea area has far more advantages than any other area in South Wales.

Perhaps one might add a last industrial zone: the immediate vicinity of the port of Cardiff is growing up in almost the same fashion as the outskirts of London, with new factories and industrial estates. These depend mainly upon the transport facilities provided by the lines of the Great Western Railway, and on the main roads.

Professor TAYLOR: I think I am fortunate in one way and unfortunate in another. What I said about my maps was very partial, very one-sided, often ill-informed, but I hoped that it would be provocative and that I should receive criticism and information which would be of help to me. Most of the speakers however have dotted the i's and crossed the t's of what I have said. I have had only one complaint, from Dr. Willatts, who said that the land use map I drew was a very bad one. I agree: and when the Land Utilization Survey takes up the task of reducing its maps to a scale which can be used in the very simple 1/M national plans I have been preparing, I shall be glad to use them.

I think it is necessary to say that the corresponding maps of Scotland are on exhibition, but we thought it would be right to let the Scottish people themselves comment on those maps. Unfortunately, no representative from Scotland was able to be present this afternoon. We shall therefore send the maps to our sister Society in Edinburgh and hope they will there be discussed.

The DEPUTY PRESIDENT: It has been the task of Professor Taylor and her small Committee to boil down their information into a series of maps, easy to understand and to follow, and these I hope will afterwards be published so that all who are interested may be able to extract more information from them. I now propose a vote of thanks, not only to Professor Taylor for opening an interesting discussion but to all those who worked with her on the Committee of this Society. In the course of months they have done a very large amount of work and I hope that full use will be made of the maps which they have produced.

Note on the maps

Acknowledgments are due to the following for assistance in preparing the maps, or for permission to use material: Mr. Beaver, Mr. A. Davies, Mr. Daysh, Mr. F. R. Gullick, Dr. Henderson, Professor Jervis, Mr. D. Linton, Mr. Manley, Dr. Selwood, Mr. A. Smailes, Miss E. M. Timberlake, Mr. A. J. Wensley, and Dr. S. W. Wooldridge.

In order to include as many maps as possible it was necessary to reduce them to a very small scale, thus rendering their detail obscure. They are then to be treated as diagrams only, and as affording a general indication of the types of maps upon which the verbal evidence offered to the Royal Commission has been based. It should be particularly noticed that the dot symbol used in Fig. 2 is smaller than that used in Fig. 3, and the two maps must not therefore be used comparatively.

ON THE FRONTIER OF BRITISH GUIANA AND BRAZIL

CAPTAIN H. CARINGTON SMITH, R.E.

Evening Meeting of the Society, 9 May 1938

BRITISH GUIANA, between Venezuelan Guiana and Surinam, or Dutch Guiana, on the Atlantic seaboard, has an area of about 90,000 square miles, divided into the coastal alluvial plain, the central sand and clay belt, and the mountain plateau. The coastal plain, from 10 to 40 miles wide, contains practically all the towns, villages, population, and cultivated land. It is flat and low, scarcely rising to 50 feet above sea-level, while along the coast much of it is actually below high-tide level, necessitating sea defences and inter-tidal drainage. The sand and clay, or centre, belt is covered with dense tropical forest, and has an average elevation of about 200 feet above sea-level. It is uninhabited except for a few lumber camps and bauxite, gold, and diamond workings.

The mountain region rises to the watershed of the Amazon, culminating in the south-west in the Roraima massif 8600 feet high and in the south in the Akarai highlands, which contain mountains touching 3000 feet, though for the most part the land averages only 1000 feet above sea-level. This belt is also covered with dense tropical forest, except for some savannahs or grass lands to the south-west, which make fair cattle country and are sparsely inhabited. While every available cleared acre of the coastal plain is under cultivation, this amounts to only a three-hundredth of the colony, the rest except for the small savannah lands being impenetrable forest. Owing to this unbroken extent of forest, the rivers form the only means of communication in the interior, or did so until the advent of the amphibian aeroplane, whose use is very limited owing to the scarcity of stretches of river on which it is possible to alight.

Until 1835 very little was known of the interior. In that year Sir Robert Schomburgk, on a commission for the Royal Geographical Society, made extensive river surveys. Amongst other journeys he ascended the Essequibo to its source, crossed the watershed and travelled down one of the tributaries of the Amazon and up another, recrossing the watershed near the source of the Courantyne, by which he returned to the Atlantic coast.

In subsequent years the savannah lands in the south-west were penetrated by settlers, more from the Brazilian side than from the British, and the Essequibo and Rupununi rivers became fairly well known. *Balata* bleeders ascended the Courantyne as far as Wonatobo falls, and a few hardy pioneers, including Barrington Brown, explored the upper Courantyne and its tributary the New river; but for the most part very little was known of the south-east corner of the colony.

In 1901 a treaty was concluded between Brazil and Great Britain whereby these countries agreed to survey and demarcate their common boundaries, defined as follows from geographical information then extant: From Mount Roraima eastwards along the watershed to the source of the Ireng river; down the Ireng to its junction with the Takatu river; up the Takatu to its source at Mount Wamariaktawa and thence eastwards along the watershed

between the tributaries of the Amazon and the several rivers draining British Guiana to the source of the Courantyne. The Venezuelan and Dutch boundaries were also defined. H.M. the King of Italy was to act as referee.

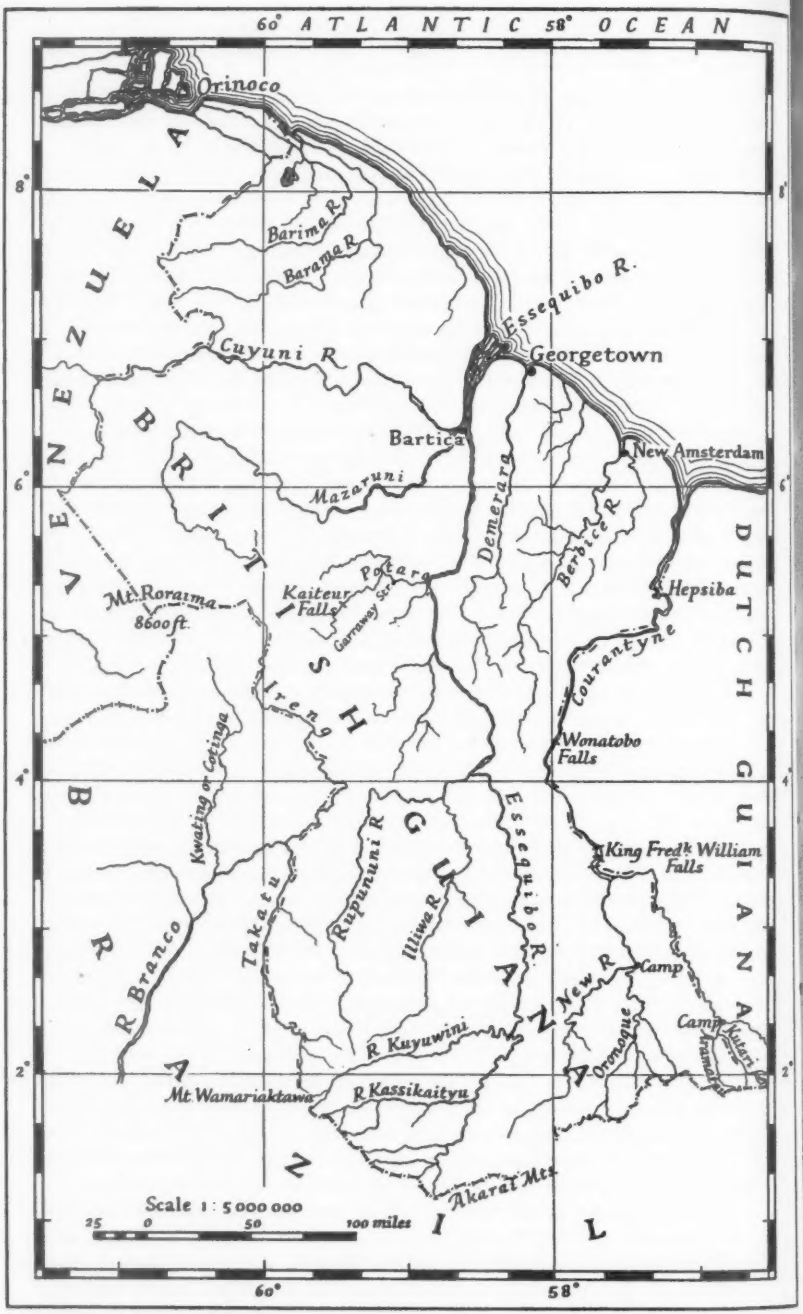
However, it was not until 1930 that field work began. In the following year a commission, set up by the colony itself, met Brazilian and Venezuelan commissions at Roraima, the western trijunction point. This point was fixed and the survey of the Brazilian boundary was commenced.

On the west side of the colony the mountain plateau drops abruptly to the sand and clay belt in a rock escarpment 1000 feet high. The rivers draining the plateau and the foothills of the Roraima range plunge over this shelf in falls rarely equalled for height or beauty, the best known being the Kaiteur falls on the Potaro; there are many others, some higher, but none of such perfect proportions of volume and height.

To reach the Kaiteur falls from Georgetown used to mean a seven-day journey by steamer and motor boat. This is now reduced to three days by overland transport between Bartica and Garraway Stream, a small settlement on the Potaro; but the most convenient and impressive route is by air. The flight takes two and a half hours and the plane alights on the river above the falls. The take-off for the return flight is an experience itself, for the plane taxis down the river and takes off over the brink of the falls. At one moment the machine is flying 100 feet off the water, the next it is 900 feet up over the mist-filled gorge. It continues down the gorge shut in on either side by steep green cliffs streaked with the white streamers of cascading forest streams.

The line of communication of the first commission leading to Roraima went up the Potaro, and these falls presented an obstacle of the first magnitude. All stores, instruments, rations, and the materials for building boats to navigate the upper river had to be carried over the portage and up the 1000-foot escarpment by manpower. It is to be hoped that the work of this first commission will some day be chronicled. The fact that the boundary which they surveyed lay largely along rivers made their survey technique and the difficulties which they encountered rather different from those of the second commission. In two and a half years' work they reached the head waters of the Essequibo and were exploring the Courantyne and New rivers with a view to opening them up when a major tragedy occurred. Most of the officers and some of the men developed beriberi, a disease usually due to certain diet deficiencies. The cause of this disaster is a mystery, for the diets of both officers and men were apparently well balanced. One theory which has obtained considerable weight attributes the outbreak to local deposits of pitchblende which impregnated the water. It is of interest to note that the worst and majority of cases occurred in the officer ranks, in spite of their higher standard of living as compared with that of the men. In the face of such a catastrophe there was no alternative but retreat, which was carried out at the beginning of 1934, but not before several lives had been lost.

In the following year the Colonial Office took over the administration of the commission, and in July 1935 three officers and four non-commissioned officers of the Royal Engineers arrived in Georgetown and commenced preparations for the following season. While a small advance party under a native boat-captain ascended the Courantyne to re-commission the boats



Sketch-map of British Guiana to illustrate the work of the British Guiana and Brazil Boundary Commission

and engines and recover the stores left at the portages by the former commission, frantic preparations went forward in Georgetown. One of the first problems was the recruitment of labour. The colony has a population of 300,000 composed of very heterogeneous elements. Originally inhabited by Indians of whom only between 6000 and 7000 survive to-day, it received a large influx of African negroes in the slave trade days, and to-day they account for 40 per cent. of the total population.

In 1850 East Indian apprentices immigrated to the sugar estates on indenture and their numbers now equal or slightly surpass those of the negroes. The remainder of the population consists of about 10 per cent. mixed and non-European, including a large number of Chinese, and about 6 per cent. of Europeans, three-quarters of whom are Portuguese.

The labourers of the commission were recruited principally from aboriginal Indians and negroes, in about equal proportions. The Indian is a likeable fellow. Dignified, reserved, and quiet, he is a good bush-man and a keen naturalist, though his small stature limits the load he can carry, and he becomes discouraged and morose quickly. He is usually a good axe-man, a fair hunter and boatman, and is very handy at constructing huts and camp furniture from local materials. The majority are intelligent, and have a very keen perception and a sense of humour. A few of them who had come into contact with mission schools could read and write a little and only one or two could not understand pidgin English, the lingua franca of the colony. No Indian willingly accepts the responsibility of leadership or authority over his fellows; they prefer to work as a soviet, none giving orders but each doing his particular job in mutual but silent agreement.

The negro has an entirely different character. His strength enables him to carry the heavy load, but he is of childish mentality, quick of temper, excitable, and delights in nothing better than making a great noise about nothing. Some were good axe-men and water-men, but the majority were not at all at home in the bush and grumbled continually. There were however notable exceptions. A few drawn from the independent farmer class were splendid all-round men and better than any Indian. Blacks and Indians worked together more or less in harmony, but usually lived in separate tents by choice. Such different characters are not belied by physical appearances. The black's negroid countenance and curly hair are in striking contrast to the straight hair and mongolian features of the Indian. The Indian has rather finely shaped feet and ankles, but the black stands splayed and firm on large, shapeless pads of gristle.

At a preliminary conference the Brazilian, Dutch, and British sections arranged to rendezvous at the eastern trijunction of the Brazil–Guiana boundary as soon as possible after the close of the wet season in August. The Dutch started up river in a fleet of canoes propelled by paddlers in July. The British followed in August by motor boat.

A camp was established at the head of deep water navigation at Hepsiba, 50 miles from the coast. It soon became apparent that the most difficult and expensive part of the commission was going to be the transportation on the line of communication: the movement of personnel and stores from the coast to the boundary.

From a geological viewpoint the rivers of British Guiana are not rivers at all, but simply large streams flowing through the bush in shallow rock and sand channels. There are no river valleys proper, the banks of these channels being only a few feet high and the topography along either side indistinguishable from that of anywhere else. The country is intersected by a series of parallel out-cropping rock reefs running east and west, over which the rivers flow in swift rapids.

An annual rainfall of 100 to 140 inches concentrated largely between the middle of May and August causes great variations in the volume of run-off. Seasonal variations of as much as 30 feet were measured quite far inland, and rises of 4 feet in a day were not uncommon. During the rainy season the rivers became rushing torrents carrying all before them and flooding the bush on either bank. At the end of the dry season on the other hand navigation is difficult and slow owing to lack of water. The keels and bottom planking of the boats soon wear out or become stove-in by frequent groundings, and propellers are often damaged.

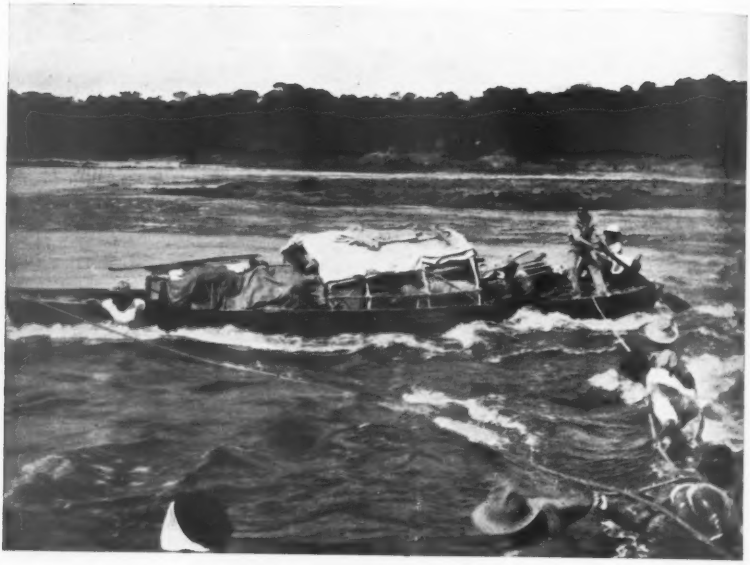
Stores and personnel were brought to Hepsiba by a schooner which once a month beat down the coast against the trade winds and sailed up the river. Here the cargo was transhipped to bateaux driven by 10-h.p. outboard motors and manned by a crew of paddlers for emergency. Constructed of green-heart with *mora* frames, the bateau is remarkable for its stability, handiness, and toughness. Not having a deck it is very resilient and can absorb an enormous fore-and-aft twist. It is steered by a large paddle lashed to the stern and another manipulated by the bow-man. This double leverage acting on the hull of small keel depth and long overhanging prow produces a very quick turn, necessary when descending swift and tortuous rapids.

In ascending the river the bateau is laboriously hauled over the rapids by warps. This requires a crew of anything up to twenty, depending on the state of the river. First the cargo is off-loaded and portaged to the top of the fall, then the bow and stern line and the warp are run out, and the boat is hauled up inch by inch against the rushing water. At the top it is reloaded, always a lengthy process, and the journey proceeds to the next rapid, probably less than an hour's steaming distant. At low water a day may be taken to negotiate one rapid less than 2 miles long, the crew camping exhausted at the top at nightfall. Thus transportation is not only precarious, but exasperatingly slow.

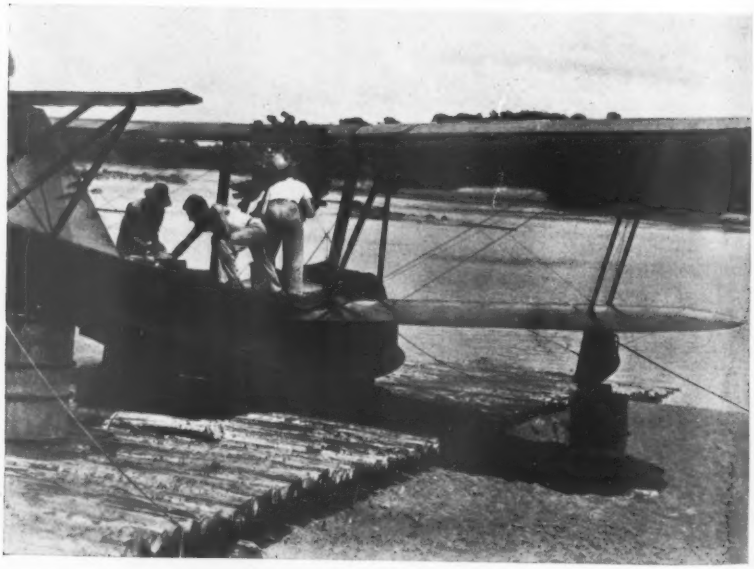
Descending the river the laboured slowness of the upward journey is replaced by a swift journey of thrills and exhilaration. The rapids are run with engines full ahead to give steerage way, and paddlers keep blades poised ready for the command of the captain. The bow-man streams with perspiration as he struggles with his large paddle, first one side, then the other, at the same time trying to maintain his balance on his precarious foothold. Submerged rocks are indicated by the whirl of water below them. The captain must pick his line and think and act quickly, much as the rider following hounds does, or the ski-er making a difficult descent; but unlike these sportsmen he cannot stop. To act too late means being stove-in and sunk in the swift water. Rapid-running as a sport, especially in a canoe, is almost

King Frederick William Falls

Kaiteur Falls



Bateau ascending the falls



The aeroplane at Wonatobo

unequalled. The Courantyne contains two falls or large rapids so swift and high that their passage is impossible, one at Wonatobo and the other at King Frederick William. Here it was necessary to establish intermediate camps and to portage baggage overland by gangs of men.

When the river becomes too small for the bateaux, dug-out canoes or *corials* continue the communication. The construction of these craft is a skilled job only understood by some Indians. First a suitable tree is found and felled. The log is cut to length, flattened on top, and tapered at the ends by a broad axe. Then it is hollowed out by adze, leaving a shell about 1½ inches thick. A fire is then kindled below the whole length and later in the hollow. When everything is hot and steaming, pointed sticks are sprung athwartships into the hollow, forcing the gunwales apart and at the same time drawing the ends up. Thwarts are then added to retain the shape, and sometimes plank gunwales to increase the freeboard. The finished article is a strong, serviceable craft, surprisingly stable and easily handled. These canoes, carrying 500 to 1000 lb. of cargo, penetrated the creeks towards the source till they would no longer float and had to be dragged by men wading.

Where the river narrows to a creek so that the forest roof closes overhead the real difficulties of river transport begin. The channel is completely blocked every 50 yards by a fallen tree. Trees growing along the bank invariably fall inwards owing to the scour of the stream. In the course of time the sapwood rots away, leaving the heartwood or *tacuba*, which apparently lasts for ever when submerged from the attentions of parasites. These trees must be cut with axe and saw to allow a passage, and as much of the cut is done under water it takes a long time. A day's hard work may produce less than a mile of progress, nor is the job then by any means finished. A week later the water-level has changed by several feet. Logs which spanned the creek well above water and allowed the canoes to pass beneath are now awash and have to be cut; or a series of formidable obstacles, formerly deep below water, are revealed and block the way. And so it goes on, axe and saw being as indispensable to the canoemen as their paddles.

Above canoe navigation everything was carried by manpower. The British Guiana negro, unlike his African cousin, cannot "head-carry," but slings his load from the shoulders in a wicker-work frame called *warishye* or *paneçu*. His working load is thus only about 70 lb., although some stout fellows habitually managed more; 70 lb. for 5 miles was a standard day's work for carriers.

It is not surprising then that the line of communication was a source of constant anxiety and a tremendous item in the expenditure of the commission. Every man on the boundary had to be maintained by five or more men on line of communication. On occasions when there was a shortage of labour from sickness or other causes, and when boat-builders worked overtime to repair damaged bottoms, it is no exaggeration to say that the commission would have had to stop for want of rations if air transport had not been used.

The commission were fortunate in obtaining the services of Mr. Arthur Williams, a free-lance American pilot operating a small flying boat on tourist flights and the transport of diamonds and gold out of the interior. Both plane and pilot were ideally suited to this dangerous and arduous task, and Mr.

Williams never stinted his efforts to "run his freight." An airport was established at Wonatobo, the first major portage, and the journey from there to Aramatau Camp was reduced from the three weeks taken by boats, even under the most suitable conditions, to two hours and twenty minutes. The plane carried only 1000 lb. in addition to pilot and flight-mechanic. Two trips a day were made in favourable weather, the start being at dawn and the final return often during the last ten minutes of daylight. The day's work was then over for every one except Williams and his mechanic, Mr. Harry Wendt. After dinner they would often work till midnight tuning the engine and servicing the hull.

No praise is too high for these two intrepid airmen. Landing at Aramatau Camp in the confined upper river was thrilling, but the take-off went to the extreme of being unpleasant. The river here is so narrow that to turn the plane on the water required the mechanic on the wing tip; before he had a chance to scramble to the cabin the machine was taxi-ing on the step and as he settled into the seat it took off. The 80-foot bush fencing a bend in the river was charged with complete unconcern, and just when the unfortunate passenger had abandoned all hope and got as far as regretting past economies, the plane rose to it like a good hunter, and flattened out above. The proximity of stalling speed was betrayed by the cloud of dust which floated up from the floor of the cabin.

The open river was always a source of new and ever-changing interest. British Guiana is a fisherman's paradise if his ambition is to land large fish rather than consider delicacy in technique. The tackle consists of stout cord approximating to clothes-line, a piano-wire trace to resist the teeth of some fish, and a hook reminiscent of a small grapnel. Fish vary in size from the small voracious *perai* weighing 2 lb. to mudfish as large as 150 lb. The former, although one of the smallest fish in the colony, is perhaps the fiercest. Short, narrow, but deep, with a powerful, well-shaped tail, he is armed with two single rows of interlocking teeth reputed to be so sharp and powerful that the removal of a man's big toe is done at one snap. Perai are best caught with a metal spinner, which after some use becomes scratched and dented by teeth marks. They were a source of continual apprehension to the boats' crews when hauling up rapids, and should a shot bird fall in the water it soon disappeared unless retrieved at once. Perai are quite edible, but not a delicacy, and very bony.

Another very fierce and even more fearless fish is the *hymara*, which inhabits the forest creeks. They average 10–12 lb., are covered with scales as large and almost as tough as penny pieces, and have teeth like the perai, but not so long or close fitting and set in much broader jaws. The body ends abruptly in a rudimentary tail, spoiling otherwise graceful lines. Hymara will go for almost anything, and have been known to attack a cross-cut saw. To clean the carcass of a bird over the side of a canoe is to risk losing it and to endanger the hands. Their flesh is firm and tasty, but full of Y-shaped bones. *Lukanani* are most prized for the pot; but *cartabac*, looking very like the perai, the graceful *koraimai*, and, on the lower rivers, the basher are all delicious.

The larger fish are the skeet and *lau-lau*, skin fish with enormous mouths, armoured heads, and grinders in place of teeth. The skeet makes a loud

honking noise when caught. The lau-lau is so strong that one hooked at Wonatobo drowned his captor by pulling him into the swift water of a rapid; the unfortunate man had wound the line around his wrist and was never seen again. Two unpleasant fish which must be given a wide berth are the sting ray and the electric eel, or numb fish of the Indian. The spiny tail of the former gives a nasty wound into which poison is injected. The latter gives a powerful electric shock until landed, when he is quite harmless.

Fishing methods include shooting by bow and arrow, a fascinating thing to watch but extremely difficult to do with success, owing to the effect of refraction when aiming and the patience required to stand motionless balanced on a precarious foothold. Chopping fish with a cutlass also requires patience. The victims are lured into shallow water by some noisome ground bait and despatched by a well-aimed stroke of a cutlass after an exciting stalk. The night line is as effective but less spectacular. A fair-sized living sapling close to the bank is stripped, bent down, and hooked on a notched stake driven in the shallow water. The line is attached to its top end and the bait thrown wide. The vicious strike springs the trap and the wretched fish describes an arc at high speed to land far in the bush.

The mammals and reptiles of the river are equally interesting. The water-hass, rather like a large guinea-pig, reputed to be the largest living rodent, is occasionally seen swimming. The otter or Indian water dog, noisy and inquisitive, is a fine swimmer with a beautiful pelt. The lucky traveller may surprise a tapir or a puma crossing, or even a small adouri swimming bravely between long rests on a moca-moca leaf or tacuba, in constant fear of being attacked by perai or hymara from below or the cayman on the surface.

The water kamoodie or American python sleeps between meals, his distended body coiled in a nest surrounded by the bones of former repasts. One we shot was over 18 feet long. They are easily killed by a well-aimed bullet in the head, but there is always the danger of mistaking the tail for the head when the snake is coiled in sleep. The cayman, in spite of his ferocious appearance, is a great coward; those encountered did not exceed 8 feet from snout to tail, although bigger ones are said to exist on the coast.

The iguana is a truly extraordinary beast, who usually advertises his presence by dropping unexpectedly from a high tree over the river with a mighty splash. His only defensive weapon is his tail, which also propels him when swimming. The iguana lays a clutch of some twenty-four shell-less eggs, the size of marbles. Both flesh and eggs are excellent to eat when properly curried.

Bathed in brilliant sunshine and bounded by perpendicular green walls of the creeper-hung forest, the river gives a first impression of tranquillity. Watch it for some time and one is conscious of the constant movement of teeming life; the pitiless war which is waged day and night for survival. Here a sudden darting furrow betrays the attack of a perai on the smaller fish in the shallows; there a large white heron, until now motionless, pounces on his fishy prey; or a family of otters on the far bank chase some unwelcome intruder, following it downstream with loud, dog-like barks.

At some seasons of the year a continuous procession of small white and yellow butterflies passes across the river. They emerge from the forest on

one side and drifting north-westerly disappear in the forest on the far side. They fill the air for 20 feet above the water as far as the eye can see up and down stream, giving the effect of a mild snowstorm. Where they go and from whence they come is a mystery, but they are always headed north-west.

The forest itself is not at peace: aloft the trees sag under their weight of creeper, trees and parasites struggling to present their leaves to the sunshine. Where the last flood water has washed away the bank, the cross section shows a solid snarl of roots, twisted, knotted and contorted in the fight for moisture and air. The palisade of moca-moca stalks vibrates slowly in the inshore current. On the broad leaf of one, fifty ants scurry in hysterical confusion; they have gained the leaf by swimming from their nest, which, dislodged from above by a falling branch, now floats downstream. In twos and threes they leave the leaf and strike out for the bank, their ranks being steadily depleted by the attacks of little fish from beneath.

During the first month or two in the forest one is conscious of oppression and uneasiness. In contrast with the brightness of the open river the forest floor is wrapped in gloom relieved here and there by the bright dots of sunlight which filters through the roof above. The thickly packed trees average 100 feet in height, their upper branches merging into an almost solid roof. Here and there individual giants rise to 300 feet, their trunks 45 feet in circumference at ground-level; a silk cotton tree of these dimensions was actually measured. The ground between the trunks is covered by slender saplings and cluttered with the debris of fallen and decaying vegetation. Visibility is about 20 yards, beyond which stealthy movement is difficult to detect. Here and there a pimpler palm rises, its bole well protected by long slender poisonous needles arranged in clusters of seven at regular intervals; or the friendly *tauri*, its giant fronds spreading in graceful curves. Everywhere there is creeper twining everything in its path in a relentless grip. It swarms up the tree trunks and spreads outwards through the roof above or hangs in festoons, tying each tree firmly to its neighbours so that the whole roof is one tangled mass.

The forest consists of many different kinds of trees in haphazard arrangement, but areas where one or two kinds are in preponderance are sometimes met. Thus Wonatobo is surrounded by mora forest almost to the exclusion of all else; and at the source of the Oronoque the pimpler palm is everywhere. The mora is a magnificent tree standing firmly on a base of solid buttresses which radiate like veins from the trunk 10 feet above ground-level, spreading outwards and decreasing in height, twisting in freakish folds until they disappear below ground-level 10 feet from the bole. Mora is much prized for boat building and is reputed to be superior to English oak. Another truly magnificent tree is the cedar, the reddish coloured wood of which gives off a delightful odour. The *yariola* tree makes excellent axe handles and paddles. The trunk is not solid, but consists of many smaller trunks joined to each other at intervals, the whole sweeping aloft like a beautiful fluted cathedral column. The boles of some trees are rough, others smooth and slippery, while some are studded by enormous conical spikes for several feet above ground-level; some do not touch the ground at all but stand supported on a multi-pod of roots.

Creepers vary in size from the thickness of a man's thigh to that of a shoelace. Some are coarse ribbons 4 inches wide and ½ an inch thick, their centres indescribably tuckered to look like a fairy staircase; others are large and soft like the warps of a ship. One freak 6 inches in diameter tied itself in a perfect thumb knot 20 feet above ground, then continued upwards, to curl around its host the tree. One kind of creeper contains water, and if a length is cut and inverted over the mouth, it gushes out, giving a satisfying drink. In its struggle to reach the upper air and sunshine, the creeper often kills its host, the tree. The gaunt trunk remains standing connected to its fellows by a hundred ropes till a sudden squall of wind will bring it and many of the supporting neighbours crashing down in tangled confusion.

Amongst this riot of vegetation surprisingly little food edible by man is found. A wild red plum and a green bean appear in isolated places. The plum has a tart sickly taste, and the pod of the bean is very sweet. Neither can be recommended. The Brazil-nut is unfortunately rare, but each tree yields an immense number of nuts. Monkeys pick the ripe pods, the size of small melons, and hammer them against the trunk till they break, when there is a wild scramble for the falling contents. A few of the palms have edible cabbages, rather like celery and quite pleasant to eat. Only one wild cacao tree was found. The soil is said to be poor, but if a clearing is made, pineapples, bananas, tomatoes and the starchy vegetables peculiar to the colony can be readily grown. There are very few flowers on the forest floor, but many of tree and creeper can be seen from the air in the forest roof.

The results accomplished in the first season's work were disappointing; base camp was established at King Frederick William falls and the trijunction party started up river from there at the end of October. The Dutch and Brazilian sections were met at the source of the Kutari at the end of the year. The source of the Courantyne was decided upon and an astronomical fix obtained. A large concrete pillar was constructed there and suitably engraved. The Dutch then departed to the east along their boundary, while the British began to work westwards. In the meantime the second British party explored the Aramatau, marked its source and started to trace the boundary eastwards. Some idea of travelling speeds can be obtained from the progress of this party: Aramatau Camp was left on January 16, but the boundary was not reached until April 14. The Oronoque was also explored and surveyed to within 10 miles of its source in preparation for the following season. Field work stopped in May, when survey parties returned to Georgetown for ten weeks, leaving fresh boats' crews to provision all camps during the high water. Base camp was moved to Oronoque. During the recess the British and Dutch sections placed pillars at the mouth of the Courantyne to mark the direction of the boundary through territorial waters.

In August 1936 the survey parties again took the field, but with a very different outlook. All ration depots were well stocked; Indian and negro labour was more plentiful and better understood by the officers; and much of the upper river was cleared for canoe communication. The international watershed was located at the source of the Oronoque by the beginning of September, and an astronomical pillar erected. The boundary was traced

eastwards, and rapid progress made through a country of small lumpy hills 200 to 300 feet high, separated from one another by creeks and swamps.

Bush survey has a rough-and-ready technique of its own. A visibility of 20 yards, often less, is not conducive to rapid topography, and forcing a passage through the tangled undergrowth is so slow and fatiguing that the extent of the day's excursion is very limited. Nevertheless, it is surprising what good results can be obtained with care and a simple routine. The boundary was to be marked by buried stones on the international watershed at not less than 5-mile intervals, the position of such marks to be indicated by a small concrete pillar. Every fifth mark or 25–30 miles of boundary was to be fixed in position by astronomical observations and the whole connected by an instrumental traverse to the order of 1/250. In addition it was the practice of the British section to map the topography for 1 to 1½ miles on either side of the watershed, but during the last season this was discontinued.

The biggest problem was to find the boundary. Running water was plentiful, but to establish whether it was British or Brazilian without tracing its course for some miles was impossible. The creek heads of each country were twisted and contorted into a maze of steep little hills, saddles, and swamps, and every hill was, of course, a watershed. A creek would often wind its way in a general southerly direction for a mile or more, only to turn and prove itself to be British. One well-remembered creek actually split in two, the main branch flowing north to the Atlantic 400 miles away, while a smaller branch bubbled under some stones and commenced its 2000-mile journey to Para at the Amazon's mouth. In desperation the boundary was placed up the centre of its bed.

Boundary location was done by Indians, and it was a very arduous task, as it entailed cutting through virgin bush from morning to night, finding creek heads and tracing the water till it declared its nationality by joining a larger creek which was already known, or by maintaining one direction for so long as to preclude the possibility of its turning back. A small party of four Indians equipped with compasses, and fondly referred to as the Advance Guard Cavalry, kept ahead of the boundary-cut doing this work. They never stuck it for long and usually became badly infected by bush yaws and sores. It was their job to mark saddles on the international watershed, and connect their marks by a *sirrahee* or line just cut sufficiently to allow passage.

The Indian has one great failing. He has no idea of direction or, if he has, is quite incapable of explaining his wanderings or of making the simplest of diagrams to illustrate them. Time and again they would report that they had discovered a big creek ahead. When asked where they invariably answered, "Right away back," and usually pointed straight above their heads. Comparisons of size were conveyed entirely by inflexion of the voice: thus a "big" hill was not uncommon; but a "BIG" hill meant something quite remarkable.

The boundary locaters' sirrahee was traversed by rope and sound for planimetry, and by aneroid barometer for height. Next came boundary cutters, who cleared the line sufficiently for the carriers and instrumental traverse. A day's work for a line clearer was 250 metres, and it was not easy. The boundary traverse was made with a 3-inch vernier theodolite set up on

A boundary cut

A forest creek

Mixing concrete at Astro Point

Boundary pillar

Boundary mark

magnetic north at every second station. Distances were obtained by stadia, and heights were carried forward by vertical angles.

In the meantime the two topographical parties worked on either flank, running a chain of rope and sound, and aneroid traverses with their apices on the boundary and bases parallel thereto. The technique of rope and sound is simple but effective. The rope is one-third of 100 metres, minus what it is expected to stretch, plus an allowance for not being laid in one straight line. The party is preceded by two cutters with a compass, who cut a sirrahee on an ordered bearing. Two men lay the rope down the requisite number of times, then the front man commences to sing. A compass bearing is taken on this sound from the last station and booked, together with the aneroid reading. The station is numbered and the party moves on. The traverse is plotted as the party moves along, streams and hill features being rapidly sketched by intelligent guessing. The Indian took well to such work, although he found the compass difficult to master.

The instrumental traverse was computed on magnetic north as the work progressed, and finally adjusted between the astronomical positions. The topographical traverses were plotted on scale 1/50,000, fitted to one another, and finally to the adjusted boundary. The results were quite encouraging. The finished boundary-cut was used as a line of communication for the carriers. As this increased in length, another creek farther to the east would be explored and opened up from its lower end, and a depot of rations placed as near the boundary as possible. When this was found by the locaters, the old line of communication was broken and the new one used.

The astronomical stations offered a welcome rest from energetic traversing. Moreover the big clearing necessary for a glimpse of the sky permitted kit, bedding, instruments, and books to be dried in the sun. Observations were made by a $3\frac{1}{2}$-inch Tavistock theodolite for ex-meridian longitudes and circum-meridian latitudes. The criterion was a probable error of about $0^{s}.02$ of time and $0''.5$ of arc respectively from means of 18 to 24 pairs of stars. Observations for azimuth were also taken.

Over 85 miles of boundary were surveyed and marked eastwards from the source of the Oronoque during the season 1936–37. In the meantime the Brazilians progressed westwards from Aramatau source. At the beginning of the following season the cuts were joined and the British struck westwards from Oronoque source towards the head waters of the Essequibo. Next season ought to see the field work completed, and the surrender of this fascinating but rather trying part of the world once more to nature.

The temperature on the forest floor has surprisingly small diurnal or annual variations. Midday temperatures are 88° to 90° F., midnight 82° to 84° F., with a 2° variation between midsummer and midwinter values. The humidity is very high, occasionally reaching saturation point, when small grey clouds of vapour form and drift between the trunks. This high humidity is one of the most unpleasant factors of bush life. To perspire gives no relief; clothes, bedding, and food are perpetually damp, and books fall to pieces after a few months. Unprotected metal corrodes overnight, and leather and glass grow whiskers of mould at an alarming rate.

Photography is beset with difficulties, and disappointments must be

expected. The shutter mechanism and diaphragm of a camera corrode rapidly in the damp atmosphere, and finally cease to function. All glass is attacked by a black fungus which spreads and engraves its surface in blotches and spidery lines. On fine days intense sunlight filtering through the forest roof produces a brilliant dapple of dazzling contrast to the gloom of the forest floor. For this reason the best results are obtained by long exposures in slightly overcast weather. These are made possible by the absence of breeze on the forest floor.

Photographic films and plates keep as long as they are stored in an air-tight canister and their seals are unbroken. Once they are opened they deteriorate rapidly, and if not developed soon after exposure the emulsion, celluloid, and paper backing become a limp, sticky mass. Except near the boundary where the springs are clear and cold, it is difficult to obtain water clean enough and at a temperature below 75° to 80° F. for development. At this temperature the process is difficult to control, and even an acid hardening bath will not eliminate reticulation and frilling. It is also almost impossible to wash negatives adequately and quite impossible to dry them. Finally, when packed away under double seals they form an excellent medium for the growth of fungus.

DISCUSSION

Before the paper the CHAIRMAN (Professor KENNETH MASON) said: It is just over one hundred years ago that the Society commissioned Sir Robert Schomburgk to carry out some exploration in southern British Guiana. We are now going to listen to an account of further work in the region by Captain Carington Smith, who has been on the Boundary Commission between British Guiana and Brazil. Some of you may remember that Captain Carington Smith was in 1933 with the Oxford University Expedition to North-East Land. You will realize that the climate of British Guiana is somewhat different! I now call upon Captain Carington Smith to read his paper.

Captain Carington Smith then read the paper printed above and Captain Gilroy showed a film of the country traversed, after which there was a discussion.

The CHAIRMAN: I will ask Captain Boulnois to add a few words.

Captain P. K. BOULNOIS: I wish I could read you some of the letters which I have had from the members of the British Guiana and Brazil Boundary Commission during the past three years whilst I have been Chief of the Geographical Section, but it is by what they leave out more than by what they say that the rigorous hardships of this particular exploratory Commission have been borne in on me. Anyhow, I took down the following from a letter penned to me by one of the officers of this Commission in January 1937, in order that I might read it in Captain Smith's hearing, and in order that you might have a little insight into the personal aspects of this work. It reads as follows:

"M. came down two days ago from the boundary with a lovely trimmed beard and has had quite enough. He is suffering badly from bush yaws, a sore which starts as a mosquito bite and then spreads and won't heal up, partly because of a special germ and partly due to general debility from fever, wet and other causes. H. has also got one or two. Herby (and I may say in parenthesis that that is the nickname of our lecturer to-night throughout the Corps of Royal Engineers) is up at the boundary, and his morale is, I hear, as usual at the peak, and B. has started to grow a king (red) beaver beard as a rival to Herby's which is, I under-

stand, modelled on that of Dr. W. G. Grace. The insects and vegetation here are luxuriant in their variety, and I am more than grateful to you for sending me to this interesting country. Yours sincerely."

And to that letter there is this most telling postscript:

"PS. In the six days I have been here, we have had 4·5 inches of rain."

I think that that strictly accurate quotation from a private letter will tell you more than words of mine can how much these officers, including Captain Smith, who have been working on this particularly unpleasant and unhealthy boundary, are deserving of our congratulations.

Captain Smith has spoken of the previous Boundary Commission presided over by Mr. Cunningham of the British Guiana Survey Department, but I should like to add my tribute to the work done by that civilian party in the years 1930 to 1934, when the whole party had to be withdrawn owing to the incidence of sickness which attacked them. Dispenser Vincent contracted beriberi in May and Mr. A. J. Cheong, who was the Deputy Head of the Commission under Mr. Cunningham, died of beriberi in October. Two other members of that Commission, Mr. De Freitas and Mr. Lord, also contracted the disease, and the latter had to be evacuated by seaplane down to Georgetown. No aspersion could therefore be cast in any way on this party, which had laboured on the frontier for no less than four years. In March 1935 Major Phipps, Captain Metford, and four N.C.Os. were sent out to British Guiana to endeavour to undertake this terribly difficult boundary delimitation. Captain Smith has told us something of the vast organization which Major Phipps had to set up in order that he could maintain his Survey parties at the heads of the Kutari and of the Oronoque. I do not think that in any previous boundary delimitation work the number of personnel required to maintain one man observing on a boundary has been as high as on the British Guiana–Brazil frontier. The last figure I had from Major Papworth, who is now the Commissioner in charge of the British party, gave a total of 321 men, yet on the boundary actually surveying he only has one N.C.O. and two officers. This means that it takes nearly one hundred men to maintain one surveyor, a proportion almost analogous to the figure of that of non-combatants to combatants in the last great war.

While I am on statistics, it may interest you to know that the first Commission under Mr. Cunningham reached the actual boundary on 16 April 1930, just over eight years ago. This must be almost a record as regards length of time required to demarcate such a short boundary, of which rather over half is riverain and therefore not in need of actual demarcation. Since July 1935, when the R.E. took over the work, there has been a continuous stream of officers going out and relieving those who have become worn out with the rigours of the climate, and altogether no fewer than eight officers, including two of the Royal Army Medical Corps, will have had the interesting experience of seeing this boundary, and will vie with Captain Smith, we hope, in the delight with which they will recount their experiences when they return home. To help them a stream of non-commissioned officers of the Ordnance Survey have been going out to British Guiana, and the total of those who have had this valuable survey training will amount also to eight before the Commission closes down.

The exact date when the British party would meet the Brazilians somewhere near the source of the Essequibo river has always been wrapped in mystery, and I have refused to give the Colonial Office and the Treasury any optimistic estimate of when the job will be finished.

The Brazilians have been very unlucky lately, and only two months ago wasted a considerable amount of their energy in following up a false watershed between the New river and the Caphiwuin. Major Papworth went up in the

famous seaplane about which we have heard so much to-night and was able to help them by his reconnaissance. The Brazilians have responded in every way, and I need hardly say that their parties have worked in the utmost cordiality with those which we have sent out. Captain Braz de Aguiar, their Chief Commissioner, has been uniformly courteous and helpful to our chiefs, and their second-in-command, Captain Cavalcanti, has won every one's admiration by his energy and resource.

As I knew that this Commission was nearly approaching its end, and as Major Papworth had assured me he was trying to get it finished before May 9, the day of this lecture, I sent him a cable in the middle of last week asking him if he could possibly report completion in time for this lecture. I have only this morning received the following reply: "Junction effected to-day with Brazilian reconnaissance parties. Expect completion May 10th."

That happy event will take place then to-morrow morning just at the time when I hope we are saying to ourselves at our breakfast tables what an extremely pleasant and interesting evening Captain Carington Smith has given us at the Royal Geographical Society to-night.

The CHAIRMAN: I wonder if Captain Gilroy has anything to say as to the health of the party?

Captain GILROY: There was a great deal of malaria in British Guiana, which everybody in the party got with, I believe, the exception of Captain Carington Smith. I do not think even malaria could do him much damage. Apart from that, bush yaws were rather a problem among the natives and also affected quite a number of the white personnel. Those are the only two big problems we had from the health point of view. Everything was really admirably run. The food and the personal comforts that make so much difference to a commission were admirably arranged for and looked after. On the whole, the health of the Commission was very good indeed.

The CHAIRMAN: We have had an extremely interesting lecture and I am not going to add anything except to thank the lecturer and those who followed him for an exceedingly enjoyable evening. I am sure you would like me to ask Captain Carington Smith the next time he is writing to his friend, Mr. Williams, to tell him how much we have admired his flying in those difficult parts. I will ask you to show your appreciation of the lecture in the usual way.

IRONWORKS AND COMMUNICATIONS IN THE WEALD IN ROMAN TIMES

ERNEST STRAKER AND IVAN D. MARGARY

IN the whole of England there is no more clearly defined area than that of the Weald. Encompassed on all sides, except where it is bounded by the English Channel, by the escarpments of the North and South Downs, the region so termed by geologists extends some 95 miles from west to east, from Petersfield to Folkestone, its greatest width being 35 miles. This however includes the Upper and Lower Greensands, with the Gault Clay between them, these strata being of marine origin and distinct in character from the Weald Clay and the Hastings beds, which are freshwater or estuarine deposits.

This inner area, bounded by the escarpments of the Lower Greensand, say roughly by the line Hindhead, Leith Hill, Redhill, and Ashford on the north, and Linch, Petworth, Henfield, Hurstpierpoint, Hailsham, and Pevensey on the south, is what was termed in early times the Wild, or Weald, being the ancient Forest of Anderida. This distinction is legally recognized, inasmuch as by ancient custom the woodland within it was exempt from tithe, as owing nothing to man's labour. The Forest was in all probability not entirely wooded, but included stretches of heathy moorland. The stickiness of the Weald Clay, the deep gills of the Hastings Sand, and the dense forest growth in a large part of the area must however have greatly impeded any travel, so much so as to foster the current belief that the Weald was almost unpenetrated in Roman times except by the well-known Stane Street from Chichester to London.

There were however two exceptions to this difficulty of travel which have received too little attention. The one is the access to the forest region by water. The valleys of the Adur, Ouse, Ashburn, Asten, Brede, Tillingham, and Rother all ran up into the forest region at a level which even to-day is but a few feet above Ordnance Datum. The alluvium, shown on the map (following p. 96) by shading, approximates to the 50-foot contour, and at many places far inland the benchmarks, which of course are well above water-level, show an elevation of from 8 to 20 feet only. Without assuming any alteration of the land-level, the silting since the Roman era must have been very considerable. The ample rainfall of the higher ground, averaging 32·5 inches per annum, has washed the friable sands of the Hastings beds down into the valleys, especially after much of the forest had been cleared and brought under the plough. This process has been paralleled on a very large scale in the United States in recent times. Many of the large ponds which were made in the sixteenth century to serve the later ironworks are dry and silted up to the level of the dam, others have been and are periodically "mudded" or cleared from silt at great expense. The silt on the now dry bottoms is frequently 6 to 10 feet in depth.

It follows that in early times the river beds were at a considerably lower level, and that the tidal flow in some cases penetrated farther into the land. The small vessels of that period would have been able to get well up the rivers, and a further distance could have been covered by boats or canoes. In 1542

the ironworks at Robertsbridge Abbey shipped their produce at Bodiam Bridge; the wharf there and that at Brede Bridge were in use quite recently.

The second method of access is the route along the remarkable central ridge or spine that runs from Rye to Uckfield, a distance of 28 miles as the crow flies, along the watershed, only crossing two petty watercourses near Dallington till within a mile of Uckfield.[1] There are modern roads along the ridge by way of Udimore, Broad Oak, and Cripps Corner, to Vinehall. At this point the road system has been entirely altered, but an old track, used in 1542 for the carriage of iron from Panningridge furnace to Robertsbridge forge and so to the shipping point on the Rother, connects it with the Battle-Heathfield road near Darvel Hole. The modern roads along the ridge from Rye to Robertsbridge by way of Udimore and Broad Oak to Vinehall, and from Battle to Uckfield by way of Netherfield, Darvel Hole, Dallington, Punnetts Town, Cade Street, Heathfield (Tower Street), Cross-in-Hand, and Framfield, are never more than one mile north or south of the straight alignment Rye to Uckfield. The break between Vinehall and a spot half-way between Netherfield and Darvel Hole is filled by the track mentioned above. Although nothing as yet has been found to prove it, and it is only *à priori* a "high road," it may be confidently taken that this route formed the channel for the supply of material from the eastern bloomeries to the roads in the west mentioned below.

Before the coming of the Romans the tribes north and south of the Weald had little need of intercourse, and were perhaps at times hostile. The Forest then served as a useful no-man's-land. The Roman occupation replaced these local jealousies by a single ordered sovereignty. The existence of London Bridge and the development of London as the chief town of the province, which it probably became by about A.D. 60, and as a nodal point where the great roads crossed the Thames, together with the growth of the iron-smelting industry when it came under Roman management, must have led to a great increase of trading activity. This was the case in the district around and beyond London and especially between London and the Wealden settlements, between these settlements and the Channel ports, and so, ultimately, between London and the Channel coast as an important short cut to the continent, avoiding east Kent. The demand for good roads across the Weald must therefore have been considerable.

It is now known that there were at least three main roads which cut right through the Weald from London to the Sussex coast near Chichester, Brighton, and Newhaven respectively, and in addition a more easterly route which connected Watling Street at Rochester, through Maidstone, with the iron smelting area in the Hastings district. After several years of fieldwork and excavation, and with the help of aerial photography, Mr. I. D. Margary has definitely proved the course and construction of the two central roads, not previously known, in detail.[2]

These roads were all properly engineered, laid out in straight alignments according to the usual Roman plan, and they show the exercise of considerable

[1] See *Sussex Notes and Queries*, May 1937.

[2] See *Sussex Archaeological Collections*, vols. lxxiii, pp. 33–82, lxxiv, pp. 16–43, and lxxvii, pp. 26–59.

skill in the choice of routes and in the avoidance of natural obstacles encountered along the chosen lines. Their construction has been examined at points where they still remain intact. Owing to the plastic nature of the soil it happens quite frequently that the entire metalled roadway has become submerged in the soft soil to the depth of a foot or more, and so has been protected from all damage by tillage and other modern changes on the surface. When the alignments are known, such portions can be traced and dug out for examination. The construction of these roads cannot at present be dated with certainty. Pottery found overlying the edges of the London–Lewes road just south of Barcombe Mills, was of early Roman date, probably not later than A.D. 150, and this suggests that, as the road had obviously been constructed before the pottery was deposited, it can hardly be much later than A.D. 100 and might be earlier. The use of very accurate straight alignments in setting out the course of the roads is also suggestive of a relatively early date, and it may be worth noting that Stane Street (from London to Chichester), the London–Lewes Way, and the London–Brighton Way, seem to come in that order as regards accuracy of alignments, and hence, possibly, in order of date. Abundant evidence of pottery and coins from sites adjoining Stane Street at various points along its course give a definite indication that the road must have existed in the latter part of the first century, and S. E. Winbolt has stated [1] that on this evidence the road must certainly have been in use by A.D. 70 and possibly before A.D. 55.

Stane Street is somewhat too far to the west of the iron district to have derived much material from an eastern source, and only at Alfoldean, near Horsham, has its use been recorded, though in considerable masses, forming a roadway 20 feet wide and 1 foot thick. This was derived from a nearby bloomery.

The London–Brighton Way, though taking a more easterly route than its modern equivalent, also merely skirts the area of the bloomeries and the use of cinder in any quantity has only been recorded upon it at Felbridge, near East Grinstead, and in smaller amounts near West Hoathly, and south of Ardingly, as a mixture with other materials.

The London–Lewes Way however passes nearer the heart of the area and cinder was used upon it most extensively. The first traces begin to appear at about $1\frac{1}{2}$ miles south of Edenbridge, and little else seems to have been used as road metal until Ashdown Forest was reached, $6\frac{1}{2}$ miles farther on. Local stone unmixed with cinder reappears there for a space, but towards the southern side of the ridge cinder becomes dominant again and continues past Maresfield and Isfield, and then in a lesser degree, mixed with other materials, almost to the foot of the Downs near Lewes. The road is usually 15–18 feet wide, but in one place near Hartfield it is as much as 35 feet wide. The thickness of metalling varies considerably, but is often as much as 12–15 inches at the centre, tapering off on each side with a distinct camber. At one point near Holtye, Cowden, the material had formed a perfect concrete for the whole mass of roadway, $15\frac{1}{2}$ feet wide and 1 foot thick. The quantity of cinder used on this road must have been enormous.

The eastern road (or West Kent Way), south of Maidstone, has not yet

[1] 'With a spade on Stane Street,' pp. 3, 215.

been fully explored, but it is known that extensive use of cinder occurs on it from Sissinghurst to Benenden. Just north of Benenden an easterly branch, leading past Tenterden towards Ashford, is also heavily metalled with cinder for at least the first $1\frac{1}{2}$ miles.

Attention may well be given to the close connection apparently shown by this road, and the London–Lewes Way, with the assumed coast-lines of the estuaries at Bodiam and Lewes respectively, for in each case the roads appear to terminate unexpectedly there. The reason for this is clear if connection with water transport was available.

The materials used on various sections of these north–south roads have been ascertained in considerable detail, and it has been found that, in general, material was brought southwards and northwards respectively along the routes, to make good the stoneless deficiency of the Weald, from the adjacent Downland regions where flint is abundant, as well as from the Greensand ridges, which afford good stone. Some fairly hard sandstone occurs in beds on Ashdown Forest, and this was also used, but it is clear that suitable material in the centre of the Weald, just where it was most needed, was difficult to get. It must have been realized at once what valuable material for the purpose was provided by the iron cinder, which was already available in large dumps at the site of any bloomery, and the roads show that much use was made of it. In several places along the line cinder was found before the road was traced out, and wrongly attributed to bloomeries at these spots, whereas it was actually material brought there for road-making. A conservative calculation shows that no less than 500,000 cubic feet, weighing some 35,000 tons, were used on the London–Lewes Way alone. Specimens of this cinder, collected from about eighty different points along these roads, are exhibited at the Museum of the Sussex Archaeological Society at Anne of Cleves House, Lewes.

The inner area of the Weald, more especially on the Hastings beds, has another great point of distinction from the marine deposits, namely that it abounds in iron ore of an easily smelted character. This ore is at the surface or at no great depth, so that it was possible to obtain it with very primitive tools from shallow pits, not in any sense mines as we now understand the term; even at the time of the greatest expansion of the industry, in Tudor and Stuart times, it was never necessary to dig deep.

It is probable that iron working was introduced into Britain by the Belgae when they came over from the continent about 250 B.C., although it may have been practised here earlier. The method by which iron was produced previous to about the fifteenth century, which still survives among primitive races, is the same in principle all over the world, although differing somewhat in detail. Although we have not much direct evidence, it is fairly certain that it consisted in this country in making a mound composed of alternate layers of iron ore and charcoal; this was covered with clay and when ignited the heat was kept up by the blast from several pairs of bellows worked by hand or foot power. Although the temperature thus obtained was insufficient to make the iron actually fluid, as in modern power-blast furnaces, the semi-fused iron in a plastic state sank to the bottom of the heap, while the molten stone, still containing much iron, remained at a higher level. On this being drawn

off, the lump of iron, now called a bloom, was hammered to further remove impurities, and became the raw material of the smith. The degree of extraction is very poor, the refuse, produced in great abundance, having an average content of 50 per cent. of iron oxide and 35 per cent. of silica, but as the ore was abundant this poor extraction was not a serious matter. The refuse produced by this method should properly be called by the Sussex term "cinder," and the word "slag" (imported from Germany long after the bloomery process had been superseded) should be confined to the refuse from the later high-blast furnaces, which frequently contains only 1 per cent. of iron oxide.

From the dates of the pottery found among the debris, it is clear that the Romans, very soon after their advent, exploited the iron industry to a very considerable extent for export purposes. It may be inferred from the fact that the Roman bloomeries each covered a large extent of ground, and that the pottery found in them ranges from a very rough ware to that of the finest quality, that they were worked in plantation fashion by considerable numbers of perhaps servile labourers, directed by superintendents of a higher class. This system was also employed in the slave mills and the scriptoriums of Rome.

We are told by Caesar and by Strabo that one of the chief exports of Britain was iron. This export trade would be most conveniently carried on in the sheltered havens of the Camber and its tributary waterways, and we find in fact that both British and Roman bloomeries occur in the greatest number in this district, as may be seen from the map. They are also frequent on the southern slopes of the central ridge, and there is a large group on the eastern slopes of the Ashdown massif, around Crowborough and Rotherfield. They are less numerous west of this, even on the Hastings beds, and only two have been found up to now on the Weald Clay west of Horsham, although another undoubtedly existed at its extreme western point, in Linch parish, which has not yet been located.

The map extends from Billingshurst in the west, to Rye in the east, covering the whole of the Hastings beds and all but about 5 miles in the extreme east of the Weald Clay, where hitherto no bloomeries have been discovered. Outside this area there are but two known bloomery sites, Lurgashall (¾ mile south of Lurgashall Church) and Ightham Mote (¾ mile north-west of Shipbourne Church), which have been omitted so as not to unduly extend the size of the map. Three however were near the new-found roads, and but one, Bardown, is remote from either.

In order to simplify the map, only the Weald Clay and the Hastings beds have been tinted; the local varieties of the latter are so faulted and intermingled that they are of no practical guidance. The small outcrop of Purbeck beds near Netherfield and Mountfield has also been ignored. The valleys of the Rother, Tillingham, and Brede, and Pevensey Level, have been shaded to show the alluvium as indicating the possibility of access by water.

The valleys of the Ouse and Adur, although they hardly penetrate to the iron districts, have also been shaded. All the other formations junior to the Weald Clay have been left uncoloured. The Roman sites are indicated by a special symbol, the British by two sizes of dots according to their apparent

extent. This classification however is very arbitrary, and is of little importance, as some of those that appear small to-day may be the remnants of large bloomeries that have been nearly cleared for road-making. The symbols along the Roman roads are intended to indicate the comparative abundance of the cinder used as road metal, but again must only be treated as a rough guide depending on the remains still traceable.

MAGNETIC WORK IN CENTRAL ASIA

W. FILCHNER

BETWEEN 1926 and 1928 I made magnetic observations at a series of positions, at intervals of 20–30 km., from Tashkent through Qulja (Ining, formerly Ningyüan), Urumchi (Tihwa), Qomul (Hami), Kinchuan (Suchow), Kaolan (Lanchow), Koko Nor, by the Tang-la to Nagchu Ka (about 200 km. north of Lhasa), and from there through Shendsa Dzong and Gartok to Leh. The astronomical position had to be determined for every station, and in connection therewith the azimuth also. At each station the declination and the horizontal and vertical intensities were determined by means of the big magnetic theodolite, the intensities being measured by timing the oscillations of the magnet in the appropriate planes. The dip was determined every 100–120 km. with the aid of the same instrument, an earth-inductor, and a galvanometer. Every 70 km. the constants were measured, and about every 100 km. they were determined by means of two deflection magnets.

At several points at which terrestrial magnetic observations had been previously made by me or by other travellers I carried out repeat measurements to determine the secular variation of the magnetic elements. Essential for the precision of these measurements were the testing and standardization of the instruments by means of closing measurements at Potsdam in relation to Niemegk, and at Dehra Dun, where Lieut.-Colonel C. M. Thompson, Major G. Bomford, R.E., and Mr. D. K. Rennick, M.B.E., gave me the greatest help.

The results of the observations of my first expedition (*Geogr. J.* 83 (1934) 416–20) have now been worked out. They make clear amongst other things that the Koko Nor region is traversed by the zero isogonal line, or line of no declination, on crossing which the declination is reversed. They also point to the conclusion, which is in accord with the results of the gravity measurements, that the ancient magnetite-bearing mountain ranges of Tibet lie deep.

The 6000-km.-long route of my first expedition is in the form of a loop, and from the cartographic point of view gives only the linear distribution of the magnetic results. In order however to grasp the terrestrial magnetic picture of Central Asia as an area, and to complete the magnetic exploration, I undertook a second expedition from 1934–38, with the object of running a chord across the loop of the first expedition, from Kaolan westwards along Koko Nor, south Tsaidam, Ayagh Kum Kul, and Charchan to Khotan, to

be prolonged thence to Leh. On this expedition also all the instruments were compared before and after with the standards at Potsdam and Dehra Dun. The second expedition was planned to last two years, but owing to a series of accidents and misfortunes it lasted four.

In those places where, during the second expedition, I was able to make a stay of any length, I also used the Schmidt field balance, and made a network of observations with it over certain small areas. The various magnets and compensation magnets were continually compared with each other, and were even occasionally checked against the magnetic theodolite.

The results of this second expedition have made it possible to extend the linear distribution of results to a more complete areal distribution, and it is now possible to make a magnetic map of the area comprising Tashkent, Urumchi, Kaolan, and Lhasa. The results of these two expeditions have also a practical value for aerial navigation, as well as for engineering and mining.

In addition to the magnetic surveys, I did other work at the request of the aerial survey section of the Chinese General Staff at Nanking, in order to supplement the aerial survey of the districts through which I travelled. In the neighbourhood of my astronomical fixes all prominent landmarks were fixed in again, and topographical sketches were made. In this way it should be easier to find the fixed points again. They can also be easily marked on aerial photographs, and the latter fitted to a strong astronomical network.

The astronomical determinations were made with an accuracy more than sufficient for the purposes for which they were intended. On the second expedition latitudes agreed to a fraction of a minute; and the longitudes, obtained by means of a short-wave receiving set made for me in the Jesuit Observatory at Siccawei (Zi Ka Wei), are accurate to at least a minute of arc. I had with me six chronometers and two stop-watches, which were compared daily with Nauen, Moscow, or Cavite. Two of the chronometers had a half-second beat.

In all, some 520 magnetic stations have been observed in the course of these last two expeditions to Central Asia. Of these some 360 were observed during the last expedition. The working up of the terrestrial magnetic results is being carried out by Professor Venske, of Potsdam; and that of the astronomical results by Professor Przybyllok, of Königsberg.

NOTE ON REMAINS OF THE ROMAN *LIMES* IN NORTH-WESTERN 'IRAQ

SIR AUREL STEIN

IN an article published in the *Journal* for January 1936, on the work of Père A. Poidebard, S.J., "La trace de Rome dans le desert de Syrie," I had given an account of the very fruitful investigations, important in both their antiquarian and geographical results, which that distinguished French scholar had carried out in 1925–32 on the remains of the Roman *Limes* or defensive road system once protecting the eastern borders of Syria. In concluding my remarks on this masterly survey, effected largely from the air with the help of the French Air Force in the Levant and under the auspices of the Académie des Inseriplions and the French Haut Commissariat in Syria, I had pointed out how desirable it was that these researches should be extended to adjacent portions of the *Limes* situated in territories which are or until recently had been under the British mandate.

Owing to the character of the ground, chiefly desert, on which these remains of Rome's easternmost frontier defences had to be looked for, the assistance of the Royal Air Force in aerial reconnaissance and photography appeared from the start an essential condition for the execution of this task. It offered a special quasi-personal attraction to me in view of the fact that in the course of my second and third Central Asian expeditions I had discovered and explored the remains of the oldest archaeologically attested *Limes* line. It lay along the route opened at the close of the second century B.C. by the Han Emperor Wu-ti from westernmost China into Turkistan. The support accorded to the plan by the British Academy, the Society of Antiquaries, and the Royal Geographical Society enabled me to secure the help of the Royal Air Force for the proposed task in a generous measure. For this I cannot feel too grateful. Archaeological examination on the ground was needed to check and supplement all observations from the air. For this the 'Iraq Petroleum Company, interested in the area to be searched, was kindly induced by Lord Cadman's recommendation to grant valuable facilities by the loan of a competent topographical assistant in the person of Surveyor Iltifat Husain, late of the Survey of India, and of the requisite motor transport.

A variety of considerations led me to select for the initial portion of my task that section of the *Limes* between Tigris and Euphrates which, situated situated in 'Iraq territory, had remained outside Père Poidebard's researches. But the exact indications his work furnished as to the Roman routes leading up to the present Syro–'Iraq border proved throughout very helpful also beyond it. The permission for the survey was readily granted by the 'Iraq Government. For this and the local assistance received through the friendly intercession of Mr. C. J. Edmonds, Adviser in the 'Iraq Ministry of the Interior, I feel duly grateful. Owing to limitations of time and other reasons no excavations were included in the programme.

The search made proved the area containing remains of the *Limes* to extend roughly over more than 120 miles from north-east to south-west and about 90 miles in the opposite direction. It would have been impossible to carry

out the search for widely scattered remains with adequate care over so great an area, even given all the advantages of aerial observation and photography, had I not found in Pilot Officer H. M. Hunt, R.A.F., a very helpful and keenly interested collaborator. For his selection and for all the very effective arrangements made for our many flights I feel deeply grateful to Air Vice-Marshal C. L. Courtney, Air Officer Commanding British Forces in 'Iraq. His kind interest in the task was a source of constant encouragement. The large series of aerial photographs of old sites, watch stations, etc., secured by Leading Aircraftsman Pascoe in the course of our flights will prove of great value when the time comes for the results to be fully analysed and recorded. The present is meant only to serve as a preliminary note.

The small town of Balad Sinjar, the ancient *Singara*, at the foot of the rugged Sinjar range, is known from classical sources to have formed a chief Roman base on the Mesopotamian *Limes* from Trajan's time down to A.D. 364, when it was abandoned by the Emperor Jovian to the Persians. After some preliminary reconnaissances from Mosul my camp was pitched there on March 8. Singara was the only definitely known site on the *Limes*, and thus offered a very convenient starting point. The ruined fortifications surviving around the deserted western part of the town proved to be distinctly Roman in their plan and foundations. It was fortunate that an exact plane-table survey of the whole site could be made before the quarrying and lime-burning operations resulting from recent building activity have finally destroyed the ancient walls and bastions.

Close examination of fortified stations to both the east and west of ancient Singara has shown that a protected line of communication passed from the Khabur river in the west along the southern foot of the Sinjar range and beyond it to Eski Mosul, the ruined site of "Old Mosul." Resting its flank there on a marked westerly bend of the Tigris, it formed an easily defended main barrier of the *Limes* against Persian aggression from the south-east. The Roman military command, with a clear eye for topographical features, had here chosen a line best suited to close a natural route for the invasion of northern Syria leading up the Tigris.

Reconnaissances in the plain to the south, now almost wholly abandoned to the desert, disclosed a line of fortified Roman posts or *castella* placed at distances of 20 to 30 miles from the foot of the Sinjar range. Numerous *tells* or debris mounds, some of them marking very large towns, showed the ground up to that line to have been under cultivation from very early, perhaps prehistoric, times. The line of *castella* stretching from north-east to south-west had obviously served as a kind of "Exterior Limes" for the better protection of the main line past Singara.

But before proceeding to the examination of these *castella* on the ground I thought it advisable to move to the north of the range in order to link up our survey with the system of Roman roads and posts which Père Poidebard had determined on the Syrian side of the frontier. It thus became possible to locate *Baba*, a stage shown by that old Roman route-map, the *Tabula* of Peutinger, on the road from *Nisibis* (the present Nisibin) to Singara, at the ruined town site of Qohbal. Farther to the west a string of *castella* was traced near the outlying hamlet of Khan-As-Sur, and then farther out in the desert

within Syrian territory another fortified station. They all proved to lie exactly along a Roman road leading straight from Nisibis to a central village tract at the northern foot of the Sinjar range, occupied by Yazidis, a curious old sect of so-called "devil worshippers." Their extensive plantations of fig-trees and vines on terraces cut with immense labour from the rocky slopes undoubtedly indicate ancient settlement.

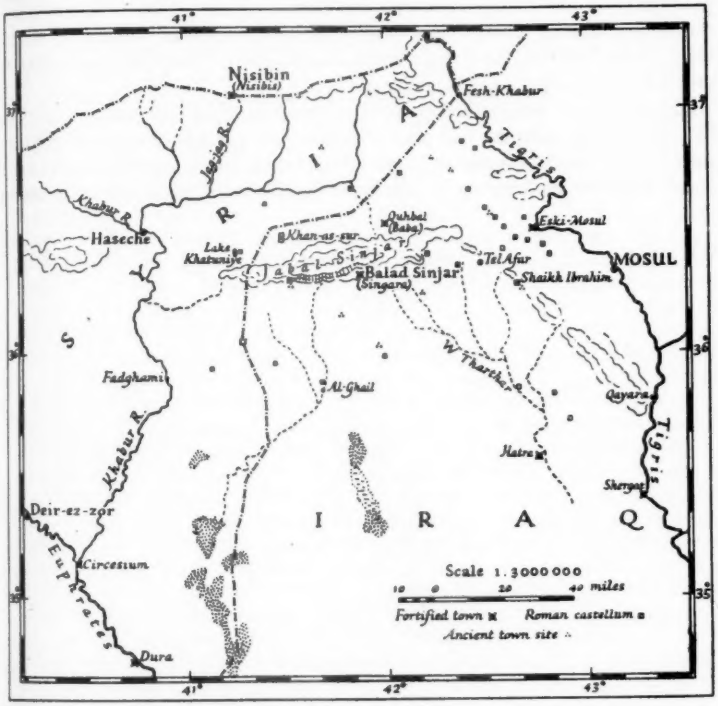
It was interesting to note when passing round first the eastern and then the western extremity of the Sinjar range proper that the saddles separating it from adjoining lower hill chains were guarded by Roman posts. The same care had been taken elsewhere to keep watch over other gaps where Persian cavalry might have found it easier to break through.

The examination on the ground of the Roman post in the desert south, to which I next proceeded, proved in some ways trying. The exceptionally heavy rain of this season had made the numerous wadis more difficult to cross with car and lorry on this trackless waste. Such water as could be found in wells near those posts was like that of the wadis, always more or less brackish. The luxuriant if short-lived growth of vegetation after the plentiful rain made it more difficult to recognize the overgrown ramparts of the ruined posts unless quite close. From the air however their rectangular and usually square plan, always correctly orientated, made them show up quite distinctly; so also did the darker colour of the vegetation in the fosse. The dimensions of the *castella* varied considerably throughout, according to the number of men they were to hold. But the recurrence of certain uniform features showed that they had all been built as it were to specification.

From here I moved down to the remarkable site of ancient *Hatra*, some 70 miles in a straight line to the south-east of Balad Sinjar. The town, marked by extensive ruins imposing in their desert setting, had enjoyed some importance as an emporium of caravan trade. As a Parthian stronghold it had faced Roman Singara since the days of the Emperor Trajan, who in vain had besieged it, as did Septimius Severus a century later. The ruins of Hatra had been thoroughly surveyed long ago by the German Assur expedition. Hence my stay could be short. But it allowed me to examine certain points of antiquarian interest, such as the remains of a besieging circumvallation about which doubts had arisen.

By following different routes on our way to and from Hatra it was possible to fill in with the plane-table an area of desert ground difficult to cross owing to salt-marshes and wadis and previously unmapped. It proved singularly devoid of traces of ancient occupation such as are plentiful in the desert farther north. This observation was of special interest in view of the graphic description left us by the historian Ammianus Marcellinus (XXV, viii, 5), an eye-witness of the extreme privations undergone here by the army of the Emperor Jovian in the summer of A.D. 364, after passing by Hatra, then already in ruins. The troops retreating from Ctesiphon, where the Emperor Julian had fallen, had marched here through a great waste lacking drinkable water and other resources. All the more striking was the discovery made on later reconnaissances that along the eastern edge of this "no-man's-land" a few Roman *castella* had been pushed out at one time, probably as advanced watch stations, to within 20 miles or so of Hatra.

After regaining the south-western end of the "Exterior Limes" at the wells of Al-Ghail, it became possible to make certain by several prolonged flights towards the Khabur river that the long chain of salt-marshes stretching south to the Euphrates had been treated by the Roman organizers of the *Limes* as a "wet border" sufficient by itself for defence. The extremely arid and much-broken character of the desert ground extending between them and the Khabur would in fact have prevented any Persian force from passing here. On the other hand definite evidence was gained showing that the "Exterior Limes" of Singara joined up here with the Roman road protected by *castella*



which ran in a perfectly straight line from the present Fadghami, on the Khabur, to Balad Sinjar. As already observed by Père Poidebard from the Syrian side, this road could be clearly seen for a considerable distance from the air.

The concluding portion of our survey was directed to the wide belt of cultivable ground stretching north-west from Mosul towards Nisibis. It is an almost flat, open valley plain between the Sinjar range and its continuation in the south-east and the hills along the winding course of the Tigris in the north. It must thus at all times have offered itself as a convenient corridor for the invasion of northern Syria, or in the opposite direction for Roman offensives. Numerous ancient debris mounds are scattered over this plain, attesting close

occupation of this very fertile tract where cultivation does not need irrigation. Here we discovered a string of Roman *castella* quite close to the present road connecting Mosul with Nisibis and seeing much motor traffic. Together with Roman bridges in the vicinity of the Eski Mosul these *castella* prove that an important line of communication had passed here through the guarded zone of the *Limes*. The present road, only an unmetalled track, evidently owes its striking straightness to following the alignment of the ancient Roman road. The majority of the ruined posts once guarding the latter are found at important road junctions. Other watch stations traced provided flanking protection on the low hills towards the Tigris. Reconnaissance flights along the Syrian frontier showed how closely the protected route lines thus determined linked up with the Roman roads traced by Père Poidebard and on desert ground still clearly visible from the air.

Enjoyable and instructive as work in this new field had been to me, the increasing heat made me feel glad when the first portion of my task was disposed of before the middle of May. I look forward to its continuation in the south, between the Euphrates and Trans-Jordan, as planned for the autumn.

REVIEWS

EUROPE

THE CLIMATE OF THE BRITISH ISLES: being an introductory study of the official records, for students and general readers. By E. G. BILHAM. *London: Macmillan & Co.*, 1938. 9×6 *inches;* xx+348 *pages; illustrations and maps.* 21*s*

A systematic account, on the basis of a large amount of scattered material, of the climate of the British Isles has long been needed, so that this book by the superintendent of the Rainfall Organization and of the department of British climatology at the Meteorological Office is to be welcomed. The treatment is essentially statistical, but the work is far more than a mere compilation, the data being skilfully discussed in relation to physical principles and geographical factors. The presentation of the subject from the official angle may however cause some passages to be rather heavy reading to the general student. The long chapter setting forth the highly complicated regional and seasonal distribution of rainfall according to some five thousand stations in the British Isles is well manipulated, and illustrated by a coloured folding map of average annual rainfall in inches for the standard thirty-five year period 1881–1915. The reader may wonder why this period continues to be retained as the standard of reference for annual and monthly fluctuations of rainfall about the normal, especially as the averages of temperature and sunshine given in the book are mainly for the period 1906–35. This is in accordance with the wise decision of the Meteorological Office henceforth to publish average values of these elements for "current experience" of thirty years, subject to revision every five years. It would seem therefore that as regards rainfall the intention is to wait till the next thirty-five-year period, 1916–50, has elapsed before fresh normals are computed, but on this point Mr. Bilham is silent. The chapter describing the various types of British weather is interesting, but the reader is not cautioned that generalizations as to relative frequency of the types in a period of only fourteen years would certainly require modification if the investigation were repeated for another period of the same length. The chapters on wind (including gales), temperature, sunshine, evaporation and percolation, and humidity, are valuable and original, but snow, hail, thunder, and ground-frost are dealt with more summarily as "miscellaneous phenomena."

Light and radiation are not specifically dealt with, but the book closes with two novel chapters on atmospheric obscurity and special types of climate. The rapid development of aviation since the war has increased the importance of visibility conditions and an elaborate code for their specification was prepared by the Meteorological Office. Mr. Bilham employs this visibility scale for defining statistics on the distribution of fog in the British Isles; but it should be remembered that such statistics must inevitably, to some extent, depend on arbitrary limits of visibility for the several grades of density of fog, mist, and haze; and these, however useful to airmen, may not always be so suitable for other purposes.

The special types of climate included in the last chapter are "coastal," "valley," and "town." The type of valley considered is not the broad open vale, but the long narrow ravine between hills where strong inversions of temperature are common at night in consequence of the drainage of cold air from the heights. The remarkable fact is brought out that the average night tempera-

ture in a Hertfordshire valley near Rickmansworth, shown by Mr. E. L. Hawke to be peculiarly favourable to the accumulation of cold air, is as low as that at Braemar. This station in quite mild general types of weather habitually records night frosts of an intensity which at London stations is only known in the coldest spells.

One feels however a little doubtful about the logic of specializing the three types of climate in question. Mountain summits like Ben Nevis or Snowdon, or elevated moorland plateaus like Crossfell or Kinderscout or, again, the exposed chalk downs, are equally specialized, as are swamps such as Wicken fen in Cambridgeshire and the arid sandy heaths of the East Anglian breck country with its steppe-like flora and semi-continental climate. Great Britain, by reason of complex physical geography and geology, is full of local varieties of climate, the complete survey of which will require many more than the 350 climatological stations upon which Mr. Bilham has relied to give us so substantial and authoritative a volume.

An introductory chapter on the physical features of the British Isles is meagre, and nothing is said about geological structure which has important reactions upon climate; but at the end of the volume we find a most valuable appendix of climatic data for thirty-nine stations. L. C. W. B.

COMPANION INTO SURREY. By L. COLLISON-MORLEY. *London: Methuen & Co.*, 1938. $7\frac{1}{2} \times 5$ *inches;* xii+268 *pages; illustrations.* 7*s* 6*d*

The aim of this book is to supply a historical and literary background to the beautiful rural regions of Surrey, and to give something of the stories of the chief county families and of notable manors. This kind of information, not usually supplied by guide-books, is very welcome, and indeed is not got together without much delving in many places. The 'Companion' series makes a special point of catering for an intelligent interest in the countryside, and Dorothy Gardiner's excursions in Dorset and Kent (*Geogr. J.* 90 (1937) 466) well illustrate the charm of the method. Thus at Guildford we meet among others Jane Austen, Tommy Onslow, Evelyn, Pepys, Archbishop Abbot, and Lewis Carroll. The author wisely keeps clear of Greater London, his nearest route being from Ewell to Croydon, in which Cheam is now "pure suburb" and Carshalton alone is a momentary oasis. He mainly keeps south of a line from Guildford to Dorking, Reigate, and Titsey. In the last few years the pleasant village of Ewell has come within the tentacles of the Wen, and the present lure of Surrey is south of the chalk Downs and the Lower Greensand hills, with their views over the Weald and the Sussex border, such as that south-west from Pitch Hill illustrated opposite p. 90 and probably the finest in the south-eastern country. In Dr. Johnson's time 120,000 acres of Surrey were wild heath and common. As to the Pilgrims' Way the author does well to accept Dr. W. Hooper's criticism of the accepted through route for Canterbury Pilgrims, which is mainly a figment of Victorian antiquaries. Where he goes, he misses very little of any kind of interest, a trustworthy and pleasant guide with a commendably sober style, who has evidently sifted the most recent literature. Is Ewhurst in "the heart of the Weald"? Mr. D. C. Whimster is thrice referred to as Wimster, and Mr. S. E. Winbolt as A. S. Winbolt. S. E. W.

THIRTY-TWO SOUTH COAST HARBOURS: aerial views and general information. By ARTHUR and CLARE VERLEY. *London: Edward Arnold & Co.*, 1938. $10 \times 7\frac{1}{2}$ *inches;* 32 *plates.* 9*s*

The book comprises thirty-two aerial photographs of south coast ports, with information on such matters as lights, anchorages, and depths of water Some

of the views, especially of the smaller places, will be very useful to strangers approaching the harbours for the first time, if they are not already in possession of the charts which give large-scale harbour-plans. For the larger places the method is not so successful, since in order to include on a reasonable scale the actual town water-front it is sometimes necessary to omit the entrance from the open sea. It would have been better if all the photographs had been taken from a uniform point of view, from seawards looking towards the entrance, and at a uniform state of tide—low water would be the most useful. Actually, some of them have been taken simply as views of scenery, and fail to give as much information as they might have done. J. A. W.

SICILY, the garden of the Mediterranean. By FRANCIS M. GUERCIO. *London: Faber and Faber*, 1938. 9×5½ *inches; 322 pages; illustrations and map.* 15*s*

Sicily as an island has benefited little by its insularity. Its inhabitants never reached the status of a nation, and as a province Sicily was normally in revolt. It has felt the force of a number of civilizations since the days of the first Greek and Carthaginian settlements; and each in turn has been largely destroyed by its successor. Even after the island had provided the jumping-off place for the venture that finally united it to the mainland, it was neglected by the central government; and land that had been one of the granaries of Rome no longer supported its own people. That situation, as Signor Guercio explains, is changed now, and recent events tend to make Sicily the "geographical centre of the Empire." After dealing with the history of Sicily, the author then describes, with a preciseness that makes up for some lack of vividness in his writing, his tours about the island, making Palermo his headquarters. The latter part of the book consists of chapters on Sicilian customs and traditions, wherein there is a sympathetic account of the religious festivals; on the marionettes and Sicilian drama; and on the language and the vernacular literature. There is a short bibliography whose contents are discussed in the Introduction; and a map which is adequate. It would, in short, be difficult to conceive of a book better planned to act as an introduction to the island. That the author is himself a Sicilian, and of English descent, may account for his successful interpretation of beauties that are essentially classical to those who are more accustomed to the "salad landscape" of England. J. P. H. M.

ÜBER DIE EISVERHÄLTNISSE DES BALTISCHEN MEERES AN den Küsten Finnlands, nebst einem Atlas. By RISTO JURVA. (Merentutkimuslaitoksen Julkaisu—Havsforskningsinstitutets Skrift. No. 114.) *Helsinki*, 1937. 9½×6½ *inches;* viii+248 *pages; maps and diagrams.* Atlas. 16×11½ *inches.* 51 *pages*

Finland is one of the countries most affected by the freezing of the Baltic, and systematic observations on ice conditions have been made since 1850. After a thorough investigation by Professor Witting in 1911–14, as many as one hundred lighthouses and signal stations gave daily reports. Up to 1925 these were compiled by the Havsforskningsinstitut into weekly bulletins sent out by post; after 1925 ice reports were sent out by wireless; and now, during the winter, there are daily wireless reports.

Dr. Jurva's analysis is based mainly on the bulletins of 1915–25. He divides the coast and the neighbouring seas into five regions, one facing southwards on to the Gulf of Finland, and four looking westwards to the Gulf of Bothnia. He distinguishes thirty stages, ranging from a first appearance of ice to a complete covering, and after a detailed analysis of the dates on which these stages have been reached, gives diagrams to show when they will be reached in

years when the onset of winter is early, normal, and late. To have arranged such a profusion of data into a workable scheme is no small achievement, and the treatment of the more recent and future observations will be greatly facilitated. Another report, which will also deal with the types of sea-ice encountered in the Baltic, and their structure, is being prepared.

Dr. Jurva's charts and diagrams have an obvious practical value, but the full importance of the work he has done will only be appreciated in the European countries whose institutions make a close study of these matters. To those less in touch with conditions in the Baltic a summary would have been helpful. Some of the diagrams are reduced until they are difficult to read.

The atlas which accompanies the report gives charts to show the ice stages distinguished by the author in each of the five regions, and it shows the dates on which they will be reached in very early, early, normal, late, and very late seasons. There are also diagrams giving ice-thickness. Smaller-scale charts cover the whole of the Gulf of Bothnia and Gulf of Finland, and a final series shows the duration of each stage of ice-covering in light, normal, and severe winters. G. E. R. D.

DIE DEUTSCHTUMSINSEL AN DER WOLGA. By LOTHAR KÖNIG. (Deutschtum und Ausland. Edited by GEORG SCHREIBER. 64/65. Heft.) *Dülmen in Westfalen: Laumann*, 1938. $9\frac{1}{2} \times 6\frac{1}{2}$ *inches;* xii, 310+viii (*plates*) *pages; illustrations and maps. M.*12

The colonial question is now much to the fore in Germany, but there is some doubt as to whether the colonies are to be settlements where Germans can live, multiply, and retain their *Deutschtum*, or whether they are to be territories exploited merely for their specialized products. Actually East and Central Europe are dotted with settlements of the former type, where Germans living together have largely retained their language, customs, and outlook; and the problem of their relations with Gross Deutschland is likely to loom large in the future.

This account of the German Volga Republic, the farthest away of all, is of particular value in view of the present attraction for Germans of the "black earth" regions of South Russia. It contains a mass of detail and statistic, geological, geographical, economic, and social, compiled with characteristic assiduity. Much of this is only for the student and specialist, yet the ordinary reader, by judicious skipping, can derive interest and profit from the book, for the general picture stands out clearly.

It is a depressing region, with a wide range of temperature between the seasons. The summer is dry and dusty, and the fierce winter storms from Asia blow away the meagre snowfall before it has time to benefit the soil. The ground on the right bank of the great river is hilly, on the left it stretches away over the unending steppes. To this dreary, empty land came the German settlers in the middle of the eighteenth century. They were drawn from many different German tribes. There were Protestants, Roman Catholics, Mennonites. Yet their hard struggle with soil, climate, and the wild peoples surging in from Asia, impelled a sense of unity. They kept apart from the Russians, scarcely even learning their language. They had their rights guaranteed by the Tsarist Government. Nevertheless, once established, the uneven fertility of the soil, and the increase of population impelled the adoption of the Russian communal (*mir*) system of landholding. Even so, over-population and over-working of the soil necessitated emigration. It is surprising to learn that there are nearly twice as many Volga Germans in the Americas as remain in the "homeland." The Stolypin reforms (1906–11) produced not only a return to

individual consolidated holdings, but also a proletariat destined for the already developing industry; but naturally things had not gone far before War and Revolution brought further changes.

The effect of these, of collectivization and industrialization, and the prospects opened up by the development of canal and road transport, are well, and on the whole objectively, described. The author is however particularly distressed that the young people are beginning to show enthusiasm for a totalitarianism with a catholic outlook defiant of all theories of racial superiority; but he expresses a hope that they may yet be saved for *Deutschtum*.

There are adequate diagrams and map, and a good selection of plates.

A. S. E.-S.

ROUMANIAN JOURNEY. By SACHEVERELL SITWELL. *London: B. T. Batsford*, 1938. 8½×5½ *inches;* viii+120 *pages; illustrations and route-map.* 8*s* 6*d*

Mr. Sitwell spent only four weeks in Romania, during which he travelled from the Hungarian border across Transylvania to the capital, and from București to the Black Sea at Valcov. There he turned back north to Iași, went up to the frontier at Hotin, and gazed at Russia across the Dniester; and then, having seen what he wanted to see in the Bukovina, made his way home through Poland. He was mainly interested in the people of Romania and their art, as revealed in their music, their dress, and the architecture of their churches: these were all things that, since he wisely made no attempt to read up the subject beforehand, discovered themselves to him with all the appeal of novelty. He is, as he modestly admits, a shade blasé, and the apparent picturesqueness of peasant life was captivating. Certainly not every one will share his enthusiasm for the gypsies—he quotes extensively from Liszt about the Laetzi, whose fingers "are always long and charged with electricity." Most people however will appreciate the description of București; and, even better, of the painted churches, like that of Sucevița, in the Bukovina. If, on the whole, the book is not as brilliant in style as might have been expected, it has (perhaps for that reason) gained in utility as an introduction to the country. It ends, in Cernăuți, on an unexpectedly serious note, when the author deals with the bleak prospects of the Jews in the Bukovina.

The book is amply illustrated and the plates are well reproduced. The captions however are singularly inadequate, and the book would have gained had they been made more explanatory. Facing p. 90, for instance, there is the wooden church at Maramureș, whose style, contrasting with that of other churches pictured, suggests Russian influence; but there is nothing in the text or on the plate to explain its wherefore in those parts.

J. P. H. M.

ASIA

THE HISTORICAL BACKGROUND OF THE BIBLE. By J. N. SCHOFIELD. *London: Thomas Nelson and Sons*, 1938. 9×5½ *inches;* x+334 *pages; illustrations and maps.* 7*s* 6*d*

This, the first publication of a young Biblical scholar, has several features which give it an interest and importance not possessed by most books on the subject. Mr. Schofield has had the advantage of a four-years' residence in Egypt and Palestine, and has thereby acquired a first-hand knowledge of the physical conditions, the progress of archaeological research, and the political problems of the Holy Land. The plan of his book is ambitious: it describes

concisely the general historical background of the Old and New Testaments; it gives some admirable accounts of archaeological work (Lachish, Ras Shamra, etc.); and acquaintance with the modern conditions frequently enables the author to make shrewd and illuminating remarks. Without going too much into detail, he allows the reader to see something of the sweeping internal vicissitudes which lie behind the actual development of Biblical history and religion; and in this way he corrects the presuppositions of those who, while regarding the Bible as a Sacred Book, overlook the historical factors in the rise of Judaism and Christianity.

Mr. Schofield's attitude is refreshingly independent. He recognizes the uncertainty still attaching to the date of the Exodus (he himself prefers the thirteenth century). He notes the perplexing variation of tradition in regard to the rise of the Monarchy. He emphasizes the immense significance of the Exilic period, which modern scholars still too much underestimate. Finally, he well stresses the disastrous fanaticism and the grave internal dissensions at the rise of Christianity, and thus shows that neither the Old Testament nor the New can be rightly understood unless we endeavour to learn all we can of the ancient land and its people.

For Palestine was a land of mixtures, its history too often marred, as Mr. Schofield notes, by fratricidal bloodshed. Geographically it is not a simple or a single land, and the fatal gulf between the Southern and Northern kingdoms, like that between Jews and Samaritans, has a biological, almost a geological, origin. One has only to consider a map of the growth of continental systems to realize how fundamental is the cleavage which has made Judaea look to the south, and Samaria and Galilee to the north, and which accounts for the course of history under the Ptolemies and Seleucids, and much later. Judaism centred upon Judah and Jerusalem, and an intense racial consciousness, severed Israelites and Jews from their Canaanite and other neighbours, to whom they were far more indebted than they knew or perhaps cared to admit. They thought of Palestine as, apart from themselves, an unpeopled land. Yet, strange to say, the normal Jewish type, as distinct from the Arab, is Armenoid, and Mr. Schofield goes so far as to speak of a Hittite, Aryan, or Indo-European affinity rather than a Semitic one. But while both the Israelites and the Muhammadan Arabs were immigrants and conquerors, each in turn influencing the cultural vicissitudes of a very ancient land, Palestine has remained Palestine, and it must be observed how "in this land, as in others, the culture of the vanquished inhabitants tends to predominate over that imported by invaders."

Needless to say, where the Bible is concerned, different readers will view Mr. Schofield's suggestions and conclusions differently, but it is timely to recognize that the modern critical view is by no means stationary, or unafraid to reconsider its foundations, and, as in the book before us, to point towards conclusions which to some readers may seem novel. Indeed, in view of our interest both in the Bible itself and in the general situation in the East to-day, any fresh treatment, such as this, is to be welcomed. S. A. C.

DER KARAKORUM: eine landeskundliche Darstellung. By HERMANN HOFMANN. *Würzburg: Konrad Triltsch*, 1938. 9×6 *inches; 62 pages; profiles and sketch-map*

This booklet summarizes a considerable portion of the literature concerning the Karakoram ranges. A chapter is devoted to the history of exploration, and is followed by descriptions of the Indus valley, Ladakh range, Kailas Karakoram, Muztagh Karakoram, Aghil Karakoram, and of the ethnography of the region. The treatment is descriptive rather than critical, and the distribution of

the ranges differs considerably from that recommended in the recent Karakoram Conference Report. The term "Kailas Karakoram" should certainly be dropped. The sketch-map on p. 58 is very indistinct; rivers, glaciers, and ranges being shown by a confused mass of spider-web lines from which no clear picture can be obtained of the individual elements. There is no sign on the map of the changes in strike shown by the ranges and mentioned in the text on p. 42. Indeed, the Ladakh range is shown crossing the Indus river by the bend east of Nyoma, although the geological work of De Terra indicates that it swings eastwards and continues north of the Indus. The scale of the map is given as 1/2 M. but appears to be approximately 1/4 M. J. B. A.

MY INDIA. By LILLIAN LUKER ASHBY with ROGER WHATELY. *London: Michael Joseph*, 1938. 9×5½ *inches;* 352 *pages.* 15*s*

Mrs. Ashby was born in Monghyr in the Province of Bengal and Bihar, of a family long settled in India. Her married life was spent in Dinapur, Gaya, and elsewhere in Bihar and Orissa; and finally in Jamshedpur, where her husband was head of the police. The story of her life, in the course of which she saw so much change in India, has a special interest, for she was as much at home with Indians as with her own people. She was a shrewd observer, and the book is very readably written.

STURM AUF DIE THRONE DER GÖTTER: die Himalaja-Expeditionen der Nachkriegszeit. By RUDOLF SKUHRA. *Berlin: Büchergilde Gutenberg*, 1938. 9½×6½ *inches;* 200 *pages; illustrations*

The German climbing expeditions of the last ten years to Nanga Parbat and Kangchenjunga have awakened a great interest in Himalayan affairs in Germany. The present volume, a summary account of expeditions to these two mountains and Mount Everest, is one of the stream of books which this interest has engendered. In fact, Himalayan literature is in such demand that there is room for books by authors whose experience of those mountains, or perhaps of any mountains, is restricted to studious reading of the original accounts.

Nevertheless, compared with some books of this type, this is a good, and indeed, useful, example. From it, for instance, a summary can at once be made of the personnel, happenings, and principal dates of all five major Everest expeditions. The same applies naturally to the German expeditions in higher degree; so that this book can be noted as a convenient volume of reference. The greater, then, the misfortune that (p. 38) the date of the beginning of the second assault on Mount Everest in 1922 is given as April 24 instead of May 24. Another statistical uncertainty appears on p. 87, where the heights of K^2 and Kangchenjunga are stated so that the latter appears to be higher. The height at present accepted for K^2 is 8611 m., not 8591; and of Kangchenjunga 8577 m., not 8603. These heights are in Survey of India terms. Nor would the name of the village Lachen, written as it stands in a German book, ever suggest the correct pronunciation.

The illustrations are few, but good. Profile sketches of mountains are adequate to help the reader to understand the narrative except in the case of Kangchenjunga, where a map should have been given to explain the different approaches. The most serious, and a typical, demerit of these German accounts lies in the style. In general where remarks are quoted they seem to be taken from the original accounts. But few of the recorded words from Mount Everest fit in with the author's romantic conception of climbing, and as a result this part of the book is almost free either of dialogue or monologue. Nothing however but first-hand acquaintance with these mountains will ever prevent a writer from

setting the tone of his book with such phrases as: "A great problem still awaits solution. There is something which man still has to achieve—the conquest of the highest peaks, the 8000-metre summits, which from their icy fastnesses reach to heaven out of the mightiest mountain chain on earth." M. A. S.

[TRANSACTIONS OF THE GLACIAL EXPEDITIONS.] Vol. IV. The Urals: the subpolar regions. *Leningrad: U.S.S.R. Committee of the Second International Polar Year at the Central Administration of the Hydro-Meteorological Service*, 1935. 9×6 *inches; 316 pages; illustrations and maps.* 14 *roubles.* 2 *r. for binding*

The surprising discovery of glaciers in the Northern Urals, first made in 1929 (*cf. Geogr. J.* 76 (1930) 363), has been described by the leader of the expedition, A. N. Aleshkov, at various times during the course of the investigations. In his article in the *Scottish Geographical Magazine*, published in 1933 (vol. 49, pp. 359–62), A. N. Aleshkov was already able to give an outline of the additional discoveries made in 1932 by a glaciological party which had been sent to the region in connection with the Second International Polar Year.

In vol. IV of the "Transactions of the Glacial Expeditions" published in the meantime, the picture is extended still further. Apart from the greater number of details this report includes also the results achieved in the following season, *i.e.* in 1933.

In addition to a general review of the activities of the glaciological expedition to the Urals, with a description of the region of Mt. Narodnaya and Mt. Sablya, A. N. Aleshkov has contributed four special articles dealing with Mt. Sablya and its glaciers, with rocks in the region of Mt. Narodnaya, with the northern part of the subpolar Ural regions, and with *hautes terraces* of the Urals.

Apart from the geological accounts the volume contains reports by V. T. Popov, V. P. Fedorov, and J. D. Zinserling on meteorological observations of the Ural glacier expedition in 1932, meteorological and hydrometrical observations in the area of Mt. Narodnaya in 1933, and on vegetation of the Sablya massif; a geomorphological sketch of the region of Mt. Narodnaya; an article on the mountain tundras of the polar Ural; and, finally, a description of the Urals as a zoogeographical unit and a biocenotic complex.

The contents of all articles are summarized in English at the end of the volume.

L. L.

EXPLORATION OF PORTUGUESE TIMOR. Report of Allied Mining Corporation to Asia Investment Company, Ltd. (*Victoria, Hong Kong*, 1937.) $12\frac{1}{2} \times 17\frac{1}{2}$ *inches; 108 pages; illustrations and maps*

This report was drafted by Mr. S. F. Wittouck, President of Allied Mining Corporation, with the assistance of several of his collaborators. It contains a monograph on Portuguese Timor, and the account of the studies, explorations, and work done by the Company in the island, the whole being illustrated with many photographs, 22 full-page maps and sketch-maps, two large folding-maps (topographical and geological on a scale of 1/250,000), and several tables and diagrams.

Timor, which forms the southernmost extension of the East Indian Archipelago and lies some 300 miles northwards of Australia, has a total area of 11,700 square miles, with approximately 700,000 inhabitants, of which more than one-half belongs to Portugal and the rest to Holland. Portuguese Timor has always been an agricultural colony, and its government paid considerable attention to the protection of the native agriculture and introduction of new crops. Timor coffee is of excellent quality and of well-established repute.

Several attempts have been made at organized agriculture in the past, but all have failed for lack of capital or other reasons.

Although the present undertaking is also interested in agriculture, it seems that its principal scope is the prospecting and exploration for mineral resources, of which several studies had already been made and some published as far back as 1872. The existence of oil and gas seepages have always attracted more attention, but the existence, among other minerals, of coal, lead, copper, and gold is also remarkable. The present company, which has been working for two years, has already found several large nuggets, one of which weighed 107 grammes. Thus the most interesting and extensive part of the report is allotted to geology and the mineral resources. Though the present publication cannot, of course, be compared with the comprehensive works of P. and F. Sarasin, Werbeek, Abendanon, and others, dealing with the geology of some of the East Indian isles, it is a valuable contribution, and takes an important place in the bibliography of Portuguese Timor. A. Z. C.

AFRICA

GEOLOGY OF EGYPT. By W. F. Hume. Vol. II. Part III. The minerals of economic value, associated with the intrusive pre-Cambrian igneous rocks and ancient sediments, and methods suggested for the dating of historical and geological times. *Cairo: Government Press*, 1937. 11×7¼ *inches;* xxxv+689–990+75 (*index*) *pages; illustrations and maps. P.T.*250

That this part of Dr. Hume's work is of importance and interest to others besides geologists is obvious at a glance; the coloured plates alone suffice to show that the minerals are dealt with not only from the economic and strictly geological points of view, but also in their historical aspects in so far as they were used by the ancient Egyptians. But the extraordinary scope of this part is not even indicated by its full title. At the end of one chapter Dr. Hume writes: "to the historian, the archaeologist, the ethnologist, the philosopher, and the theologian, these [new factors] are of the first importance, as indeed they must be to all those who seek to understand a little of the meaning of the Universe and its history." His remark is justified, but how many of those who would appreciate what he has written would think of looking for it in 'The geology of Egypt'?

The material which may be legitimately included under the main title is divided into three chapters (pp. 689–873), dealing respectively with gold, all other metals of which ores have been found in the pre-Cambrian rocks of Egypt, and with the precious or semi-precious minerals and ornamental or economically useful rocks associated with that formation. The first section of Chapter VII gives a history of the mining and use of gold in Egypt from prehistoric times to the Arab Conquest, and starts with a full discussion of the well-known XIXth Dynasty mine-plan from the Turin papyrus. The plan itself is shown in the original colours on Plate CLIX; the conclusion is reached that the exact site indicated has not yet been located. Gold objects of various dates are shown on eight colour plates, the earliest being a gold-handled flint dagger of the second Pre-Dynastic period, 4000 B.C. or earlier. It is noteworthy that the majority of ancient Egyptian gold objects really consist of a layer of gold only 0·2 to 0·3 mm. thick moulded on a core. All the known ancient workings are then described and in many cases illustrated by photographs; by the XIXth Dynasty many of them had reached depths exceeding 200 feet from the surface. In one instance a statement is quoted to the effect that "there is abundant

evidence that fire-setting was the chief method employed by the ancients for the disintegration of the quartz." This method was universally employed from the earliest times and in some parts of the world less than a hundred years ago.

Recent workings for gold are fully described and the output for the years 1902 to 1927 is given as 86,941 oz., valued at £371,020. This meagre result is the reason for the next two sections of the chapter, on the relationship of the auriferous deposits to the rocks containing them and on the possible mode of origin of the Egyptian gold deposits. Recent work on the manner in which gold has been concentrated in workable quantities throughout the world is admirably discussed and summarized. It leads up to some twelve pages which "represent a small effort which the writer has made to crystallize his own thinking on the origin and distribution of gold, a hypothesis to be tested as new facts are accumulated," pages which are themselves summarized in the conclusion that "with regard to the future possibilities of gold mining in Egypt, it must always be borne in mind that a close watch should be kept on those areas where calcareous or graphic schists, themselves in close proximity to intermediate igneous rocks (hornblende-granites or diorites), pass underneath Nubian sandstone." Even allowing for the intentionally encyclopaedic character of the 'Geology of Egypt,' it might have been better if Dr. Hume had published a separate treatise on gold and here referred to it as giving the foundations for his conclusions.

Chapter VIII deals with occurrences of silver, copper, iron, tin, etc., in the pre-Cambrian rocks of Egypt. The first two metals are dealt with on much the same general lines as gold. The copper workings in Sinai are only briefly mentioned as the ores are associated with the carboniferous limestone and will be fully described in a later volume. In the section dealing with iron Dr. Hume is for once tantalizing by reason of an omission. He mentions that L. H. Nassim has found an important stela near Aswan which has a direct bearing on the question of the employment of iron by the ancient Egyptians; but the oolitic iron ores of that district are connected with the Nubian sandstone and will be described in volume III. It is also noticeable that there is no full discussion of the meteoric versus terrestrial origin for the iron used in ancient times. The other metals listed mostly occupy quite short paragraphs, but that on tin is important as being the first record of its presence in the rocks of Egypt. There are good coloured figures of specimens of copper ores, molybdenite, and beryl (emerald) illustrating the next section.

Precious stones, in the modern sense, are of little importance, but it is pointed out that in ancient times their chief value was as talismans rather than ornaments. The ancient topaz is definitely stated to be peridot and the "Island of Topazios in the Red Sea," St. John Island near Ras Benas. Egyptian beryl is not likely to yield emeralds of value, but may become an important source of beryllium. The most interesting of the rocks employed for building or sculpture is the diorite or anorthosite-gneiss used for statues of Chephren and Cheops and other purposes. The source of this rock has at last been identified in quarries 65 kilometres north-west of Abu Simbel. The quarries are described in volume I, but here we are given coloured plates of the finest of the statues (no indication of the size is provided), of hand specimens of the rock, of microscopic slides of the rock, and of a fragment of the statue to show their identity; these are excellent petrographic illustrations apart from their historic interest. There are also photographs of the quarry sites.

Chapter X on historical and geological dating falls under three headings " (a) the dating of the Dynastic Periods in which Egypt had a history recorded

on stone or papyrus, (b) the efforts at determination of the age of various divisions of that period in pre-history, which may be broadly described as the Stone Age. . . . (c) the methods which seek to determine the ages of the geological periods into which the earth's history has been divided." As far as the present writer is capable of judging, the first section, with its discussion of the Sothic year and the ancient Egyptian calendar, the division of the historic period into dynasties and the somewhat conflicting systems of dating these, and of Professor Petrie's scheme of sequence-dates for the Badarian and other divisions of the pre-Dynastic Period is thoroughly sound. Under the second heading the divisions of the Stone Age in Egypt, as indicated in the work of Sandford and Arkell, Caton-Thompson and Gardner, Bovier-Lapierre and others is compared with the results recently obtained in Palestine. The relationship between the Stone Age and changes of climate involves such subjects as the Kentish eoliths and Sub-Crag industries, the validity throughout the world of Penck's glacial periods and De Geer's varve chronology, the evolution of *Homo sapiens* and many other more or less relevant questions. Surely this discussion would have been more appropriate to a final volume dealing with the Pleistocene than to a part, and not even the final part, of the volume on the pre-Cambrian.

It is however the intention to compare or contrast the dating of human with that of geological periods, to which the last section of the present part is devoted. It is only possible here to quote the three main headings, namely "Chronology as based on an invertebrate fauna," which includes a discussion of opposing views on the time represented by a hemera in the Jurassic system of England, "Relative rates of deposition of sediments," and " Dating as determined by radioactivity."

The present writer feels that all Dr. Hume's work is valuable, but unless reviewers are at pains to indicate the extraordinary variety of the subjects dealt with, the value will remain potential rather than actual, since no one would expect to find more than a small part of it under the short title of the work which must inevitably be used in libraries. C. N. B.

NEWSGIRL IN EGYPT. By BARBARA BOARD. *London: Michael Joseph*, 1938. 9×5½ *inches; 276 pages; illustrations.* 12*s* 6*d*

"From highest to lowest," writes Miss Board, "every one in Egypt is fascinating." Armed with this kind of optimism, much perseverance and a scant knowledge of Arabic, Miss Board set out from Cairo in the summer, determined to view every aspect of the country, from the coronation of the King to life in a mud hut on the banks of the Nile. Even the less attractive habits of the Sudanis had their charm, and everything she saw is faithfully chronicled.

FIRST MOROCCAN JOURNEY. By Vice-Admiral C. V. USBORNE. (Pitman's Travel Series.) *London: Sir Isaac Pitman and Sons*, 1938. 7½×5 *inches;* iv+108 *pages; illustrations and sketch-map.* 1*s* 9*d*

This is a very attractive little book. It is intended to be chatty, and it is certainly that, but it is also accurate both in the atmosphere it evokes and in the details it portrays. It is often amusing and always very readable, and the only things about it one finds to regret are the most unworthy picture map and the single ill-chosen illustration of the native quarter of Rabat. The book describes the author's impressions and experiences between Tangier and the farthest south-west and south-east of the Morocco that has only recently been completely pacified. As the writer was given many very special privileges his account is more than usually interesting. W. F.

NIGER IBOS. By G. T. BASDEN. *London: Seeley, Service & Co.*, [1938]. 9 × 5½ *inches;* 448 (*incl.* xxxii) *pages; illustrations and sketch-map.* 21*s*

Few students of Africa are aware that the Ibo-speaking peoples of Nigeria are, with the possible exception of the Hausa, numerically the most important tribal group in Africa. Their numbers can be safely put at close on 4,000,000. And yet the published data relating to the Ibo are meagre in the extreme. The present volume, by one who as a missionary has lived in close touch with Ibo communities for upwards of thirty-five years, does much to fill the gap. Dr. Basden had previously told us something of the people in an earlier volume entitled 'Among the Ibos of Nigeria,' but his latest work is more substantial and its factual material is a considerable addition to African anthropology.

The book opens with some general remarks on the indigenous religious conceptions of the people and then describes the sacrificial system, and some of the "oracles" which, as in many regions of the ancient world, played a part—a sinister part too often in Iboland—as the final courts of appeal in all disputes. Much of the evidence cited is first hand and in describing the former practice of human sacrifice Dr. Basden gives as his authority a man who had himself been selected as a victim and was about to be "charged" with the sins of the people—the final preliminary to execution—when, through the exertions of a friend, he was released, another being brought to take his place. The released man then witnessed tortures which he himself would have had to undergo. In another chapter an attempt is made to trace similarities between the religion of the Ibo and that of the Israelites; but in this Dr. Basden is not very convincing, as almost all of the customs cited have a world-wide distribution and are not special to Ibos or Israelites.

Later chapters deal with kings and chiefs, home life, social etiquette, birth, childhood, youth to old age, marriage, polygamy and divorce, slavery, land tenure and inheritance, women's work, marketing, day and night clubs, fireside stories, and a number of other topics. Here we have a mass of information, but through an obvious defect in the method of presentation the reader is unable to determine how far the institutions described are alive or dead. Nor is the author always free from exaggeration and inconsistency. He says, for example, that the guardian of *ọ̈fọ̈* (a sacred ancestral staff) is seldom a man of any prominence in the village, whereas it would be truer to say that in most villages the majority of prominent men are holders of *ọ̈fọ̈*. There is also the strange statement that "the ideas of the native are indefinite—he has no fixed thoughts." Then we read that "there is a school of thought which says that polygamy is an ancient custom—why change it? The logical opinion of this school is that the native should be kept in his place." But this is an illogical argument. And it is illogical to say (p. 125) that "the importation of liquor is not the best way to conserve native customs." Nobody maintains that it is.

It is also difficult to ascertain what views Dr. Basden really holds regarding the Government's policy of utilizing the dynamic institutions of the people as instruments of local self-government. He appears from several passages to be strongly opposed to it and says that "to contemplate conserving native law and custom is to concern ourselves very largely with a corpse." But this assumes a static condition of native law which is not in accordance with the facts. Dr. Basden later states that "the native asks to be left unfettered in his selection of customs in order to be free to choose those that suit his natural environment." This however is one of the main objects of the Government's policy.

There are a number of misprints, such as Jukum for Jukun (p. 75), Bachame for Bachama (p. 160). It is hardly correct also to say (p. 150) that "The Ibo calendar is divided into thirteen lunar months," since the Ibo year is a seasonal

or agricultural year. For the rest, many Ibo, as well as Europeans, will be grateful to Dr. Basden for this extremely interesting account of the institutions of Iboland, whether those institutions now belong to bygone days or continue to express the life of a vigorous people who are showing themselves well able to move forward with the times. C. K. M.

AIRMAN LOST IN AFRICA. By CAREL BIRKBY. *London: Frederick Muller*, 1938. 9×5½ *inches; 288 pages; illustrations and route-map.* 15*s*

Mr. Birkby accompanied the South African airman, John Williamson, on his flight in search of Carl Nauer, a Swiss who attempted to break the Cape to London record in 1933. Nauer was last seen off the mouth of the Congo, and is assumed to have been forced down and drowned at sea. The narrative of the search is told forcefully, and serves as a frame for a good deal of interesting detail about the early days of long-distance flying in southern Africa and for more hackneyed historical parentheses. If the humour is sometimes boisterous and the author's constant denial of heroism is a little irritating, the book, as the record of a task carried out despite continual obstacles in a difficult environment, makes entertaining reading. Mr. Williamson's own report, printed as an appendix, forms an interesting contrast to the work of his journalist companion.

NORTH AMERICA

ESKIMOKÜNSTLER: Teilergebnis einer ethnographischen Expedition in Alaska von Juni 1936 bis April 1937. By HANS HIMMELHEBER. *Stuttgart: Strecker und Schröder*, 1938. 8½×6 *inches;* viii+112+viii (*plates*) *pages; illustrations and route-map. M.*6

Mr. Himmelheber came from a study of the art of the natives of West Africa to the Alaskan Eskimo, whom he visited on St. Lawrence Island, Hooper Bay, and Seward Peninsular before staying for seven months on Nunivak Island. Here he was the only white man amongst a small colony of Eskimo who still retain the Alaskan culture.

Like many other visitors, he was very favourably impressed by the American administration, which trains Eskimo to live as hunters, trappers or fishers, doing work which is natural to them. Reindeer have been introduced and the government has helped the Eskimo to be stable and self-supporting. He found three distinct art groups: south of Norton Sound, characterized by wood carving (masks), painting, and snow drawing; from Seward Peninsular to Point Hope where the Eskimo cut and engrave ivory, where there are few masks and fewer paintings; and north of Point Hope to Point Barrow where there is only a little carving. From Cape Prince of Wales to St. Michael the natives carve curios for export.

The author not only examined any examples of artistic work he met, but also persuaded Eskimo to work for him. He found their outlook on art completely different from the European's. Their work is pure illustration and not based on any decorative feeling. They draw or paint to help them tell their stories or adventures the better. There is for them no art for its own sake; it only appears where it is a necessary accessory. Nevertheless the Alaskan Eskimo were by no means insensitive to beauty in the European sense and showed their awareness of the meaning of good line and good composition.

For them there is no value in an artistic object once it has been used. Masks are burnt after festivals, and painted drums, objects of much admiration during the ceremony, are rolled up and put away, to be washed and painted with different scenes before the next festival. Their apathy about decorative art is expressed

in the drab condition of their houses. Sometimes objects are carved with various devices and appear to be decorated, but a truer explanation by Weyer is quoted by the author: "Besides their utility these boxes are believed to impart mysterious potency to the weapons: the hunter will put his weapons into one of them, to give the articles the proper spiritual benefit, with all the confidence of a surgeon putting his operating tools into a sterilizing cabinet." Nor can it be claimed that the hard conditions of their life are responsible for the absence of beautiful things, for actually the circumstances of the Alaskan natives are very congenial.

There are nine winter festivals to which almost all Eskimo art is related. They are all between November and March and, with the exception of the Death Festival, are occasions for much song and merriment. The principal "objets d'art" required for them are the painted drums. Traditional family stories of adventure, mostly concerned with hunting incidents, provide the scenes which the paintings illustrate. Descriptions however which to an Eskimo are objective may, to a European, have a fantastic quality through the introduction of ghosts and spirits; the reviewers do not feel with the author that the truth of the descriptions is confused by the inclusion of an irrational element. An artist is restricted in the material of these paintings to the sagas of his own family and may not relate his own adventures. At any feast the host, or hosts, supply the drums; during meals, after a rap on one of them to secure attention, the owner proceeds to tell the story depicted.

The Eskimo do not single out artistically gifted persons for any especial distinction; nor does the artist himself value his abilities particularly, though he gets a great deal of pleasure from his work. Work in progress is sometimes exchanged from one man to another because "two persons detect more mistakes than one"—showing how little artistic expression is assumed to be individual. In collecting this information Mr. Himmelheber has not only written a most interesting introduction to a detailed scientific work which he is preparing, but also given us a delightful account of a delightful people. E. H. S.
M. A. S.

ECONOMIC GEOLOGY. By H. RIES. Seventh edition. *New York: John Wiley and Sons—London: Chapman and Hall*, 1937. $9\frac{1}{2} \times 6$ *inches;* viii+720 *pages; illustrations and maps.* 25*s*

The title of Professor Ries' book is misleading, but it has become such a standard work under its present name that no change in this respect can be expected. It deals almost exclusively with the economically important rocks and minerals of America, while equally valuable and significant deposits in other countries are only mentioned briefly or not at all.

The present volume has been brought up to date without making it any longer than the preceding sixth edition by reducing the detail in which the mineral statistics are given. The valuable lists of references have in many cases been lengthened. There is still the same wealth of illustration in the form of maps, diagrams, and reproductions from photographs, but the latter have deteriorated conspicuously, no doubt due to wear of the blocks. The genetic aspects of the rocks and ores described are dealt with only briefly. It is therefore a book for those with an essentially practical interest in the economic geology of the United States, and with these limitations it may be strongly recommended. L. R. W.

HIGH AND DRY. By WILLIAM GUY CARR. *London: Hutchinson & Co.*, 1938. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 254 *pages; illustrations.* 12*s* 6*d*

This is the third instalment of Mr. Carr's autobiography, dealing with life after the Armistice. After following the sea for a year or two, he abandoned his career

to become a farmer in Canada. Since 1920, as he confesses, he has done most things in Canada save farm, from house painting to free-lance journalism. His real ambition however was to write; and the racy and outspoken manner of this book suggests that writing is his true vocation. The book provides an interesting picture of life in the Dominion after the war.

CENTRAL AND SOUTH AMERICA

HISTORIA ECONOMICA DO BRASIL 1500–1820. By ROBERTO C. SIMONSEN. ("Brasiliana." Vols. 100, A and B.) By ROBERTO C. SIMONSEN. *São Paulo: Companhia Editora Nacional*, 1937. $7\frac{1}{2} \times 5$ *inches. Tomo I, 374 pages; tomo II, 372 pages; illustrations and maps*

This book contains, besides a preface by Afranio Peixoto and many letters of congratulation addressed to the author by his admirers, a series of lectures given in São Paulo during 1936. Though it is more the work of a scholar than a text-book, at times it seems rather like an anthology or compilation. Well acquainted with many of both the earlier and the more recent studies on the economic history of Portugal and Brazil, Dr. Simonsen has an intimate and scholarly knowledge of his subject and writes with discernment. His book, being the first work dealing specially with the matter, and in some detail, is of real value to students of Portuguese and Brazilian history. It covers the period during which Brazil was a Portuguese colony, from her official discovery in 1500 down to her independence in 1822.

After describing the economic conditions in Europe which, in part, led Portugal to her discoveries, Dr. Simonsen studies the principal periods of the evolution of Brazil's economy: Brazil-wood, sugar, cattle breeding, gold and diamonds, and coffee. Among several noteworthy items in these different studies, one must point out, as particularly interesting, the comment on the influence of Brazilian-produced gold in British economy, mainly through the Methuen Treaty made with Portugal in 1703.

Dr. Simonsen is a native of São Paulo, and although the influence of São Paulo in the economic history of Brazil cannot be denied, one cannot fail to notice the author's love for his native town, the rest of the country not being dealt with to the same extent. Dr. Simonsen recognizes how the colonial past of Brazil still influences her present life, and throughout the whole book he warmly praises the administrative and colonial capacities of the mother country. He pays a special tribute to the Marquis of Pombal, and a still greater one to King John VI, who went to Rio de Janeiro with his court in 1807, escorted by a British fleet, on account of the invasion of Portugal by the Napoleonic armies, and stayed there until 1821. With him went about 15,000 Portuguese, many of them of the best nobility of the kingdom. Besides numerous works of art and a precious library which remained there, two hundred million cruzados, equivalent to twenty-two million pounds, were transferred to Rio de Janeiro. When the king returned to Portugal he brought with him fifty million cruzados only.

A few slips, though it is somehow strange they should appear in a book of this kind, do not deprive it of its interest. We cannot affirm, as the author writes (vol. I, p. 121), that a Spanish expedition entered the River Plate in 1511. The first of which there is positive evidence was Portuguese, in 1513–14, which is also confirmed by a document discovered in Seville and published in 1935. It is said (I, 123) that the Portuguese wished to place as far westwards as possible the line of demarcation of the Tordesillas Treaty, signed "1484" and confirmed 1506, because "at that time" they wanted to include the Moluccas in the

Portuguese sphere. The Tordesillas Treaty was signed in 1494; if there was then in Portugal any idea of the Moluccas (possibly sent by Pero da Covilhã, from Cairo, in 1490 or 1491, after his return from Calicut and Ormuz), it was very vague, and in 1506 they were known only through references brought from India. The Portuguese arrived in the Moluccas for the first time in 1512.

King Manuel of Portugal may be regarded as a merchant king, but it is hardly true that he was "an authentic capitalist" (I, 126). The famous book of Pero Magalhães de Gandavo, 'Historia da Provincia Sancta Cruz,' was written about 1575, and published in 1576 (a rare copy is extant in the British Museum); its title is not 'Tratado da Terra do Brazil,' and it was not written between 1560 and 1570 (I, 135) or about 1570 (I, 192). Toribio Medina showed in 1894 that Orellana took with him sixty companions in his voyage down the Amazon, and not seventy as stated (II, 106). The author seems to imply (II, 201) that the clove (*Eugenia sp.*) is a native plant of Brazil. It is generally believed that its seedlings were introduced in 1770 by the French from the East Indies into Mauritius, then taken to Cayenne in 1784, whence the plant spread in tropical America. There are however documents in the British Museum (MSS. Add. 20,880 and 20,885), dated between 1691 and 1725, showing that the Portuguese sent many plants from India to Brazil. Although referring (II, 315) to Fulton's experiment in the Hudson River, in 1807, and to the introduction of the first steamship in Brazil, in 1819, we find on p. 313 a table of the "Number of steamers (*Vapores*) which arrived at Rio de Janeiro" between 1805 and 1820. The total given is 13,724, of which 810 arrived in 1805. As matter of fact the first Atlantic crossing, by sailing ship with auxiliary machinery, was in 1818.

These few remarks do not much impair the book, the value of which is increased by two excellent maps of Brazil by the well-known cartographer Colonel F. Jaguaribe de Mattos. A. Z. C.

AUSTRALASIA AND PACIFIC

PHILLIP OF AUSTRALIA: an account of the settlement at Sydney Cove, 1788–92. By M. Barnard Eldershaw. *London and Sydney: George G. Harrap & Co.*, 1938. 9×5½ *inches;* 366 *pages; portrait.* 15*s*

From the collaborators known as M. Barnard Eldershaw we are entitled to expect good work. In 'Phillip of Australia' their work is good while they remain on their own ground, but too often they step beyond it. Satisfactory colonial history can be written only after research both at home and overseas, yet the documentary support is that of the Mitchell Library (Sydney) alone. The authors' failure to recognize their choice either of working in the Public Record Office or of refraining to write of the period before 1788 has damaged the foundations of a good book; and their assured tone of tolerant irony has betrayed themselves rather than the times and persons they are so ready to judge.

Their book is a valiant attempt to provide Australia with a hero, but the figure never quite comes to life. They represent Phillip as "a granite wall of competence" standing alone against the supposed incompetence of the eighteenth century, a period they by no means understand. "He was the first man to believe in the future of Australia as a white nation while it was still unreasonable to believe. Australia is his monument" (p. 344). In a book so exceptionally rich in quoted evidence and quoted gossip, this extravagant thesis is supported mainly by quotation from an *aide-mémoire* which Phillip composed before the fleet sailed. There are grounds for believing that the plans for the settlement were the result of earnest collaboration between Viscount Sydney and Phillip,

but Sydney is not allowed to speak for himself: in fact, the authors detest him, as the personification of "the official mind." From the moment the fleet sails the story becomes better, though much of it throws no light on Phillip, and important things, like the duties of the *Sirius* as a survey vessel, and the astronomical work of Lieut. Dawes, are neglected or misunderstood. Irresponsible fun is made of chronometers, though the authors obviously do not know what they are for. With the first sight of the coast of New South Wales the book lifts (the ladies are on their own ground at last), and when we reach Norfolk Island it is vividly alive. The Australian section, which means the bulk of the book, is work of real penetration, though some interesting germs of Australian history have escaped the microscope: the care of the British to claim nothing that might lead to dispute with the Dutch, the sense of strategic isolation overtly expressed in the journals of Tench and White and so strong in Australia to-day, the beginnings of public finance, of private trading, of education. But Phillip, the one character whose weaknesses are not rather mercilessly exposed, is subordinate to the events; and Melbourne, Adelaide, Perth, may reasonably question the claim made for him, without detracting at all from the true measure of his gallant and arduous performance. M. A.

THE STRANGE CASE OF MARY BRYANT. By GEOFFREY RAWSON. *London: Robert Hale*, 1938. 8½×5½ *inches; 288 pages; illustrations and route-map.* 12*s* 6*d*

Commander Rawson covers much the same ground and period as M. Barnard Eldershaw, but necessarily with narrower scope, and his book is without artifice. He has carefully documented the tale of Mary Bryant, from the time of her arrest at Winchester in 1786 (or 1787, for pp. 15 and 21 give different dates), to her release from Newgate in 1793, and has cast it, very successfully, into the form of a novel. Mary Bryant and her husband were transported to Sydney Cove, and the most interesting part of the book is the story of their escape in a fishing boat, on 27 March 1791. It took them sixty days to reach Cape York, and only nine days more, running before the monsoon, to reach Koepang, where they were eventually arrested again, and sent to England with some of the mutineers of the *Bounty*. They were the first, perhaps, to sail up the east coast of Australia after Cook, for the *Supply*, in 1790, most probably made the Outer Passage. Unfortunately there is very little on record about the voyage. According to Commander Rawson, the unpublished journals of Captain Bligh and Lieut. Tobin in the Mitchell Library (Sydney) both allude to a journal, kept by William Bryant, as being in the possession of the Governor of Timor in 1792. It may still survive; and the mere mention of it is enough to make this a tantalizing book. 1792 should read 1791, on pp. 170, 177, and 179. M. A.

THE FIRST FLEET: the record of the foundation of Australia from its conception to the settlement at Sydney Cove. Compiled from the original documents in the Public Record Office, with extracts from the log-books of H.M.S. *Sirius*, and an introduction and notes, by OWEN RUTTER. [*London*]: *The Golden Cockerel Press*, 1937. 13×7½ *inches; 150 pages; illustrations and facsimile plan.* £3 3*s*

In this well-produced volume Mr. Rutter has assembled the more important documents concerning the foundation of the first settlement in New South Wales. They fall into two classes: those dealing with the inception of the scheme and those dealing with the organization of the fleet under Captain Phillip. The suggestion that Botany Bay should be the site for a convict settlement was advanced by Sir Joseph Banks in 1779; four years later James Matra submitted

another scheme for a settlement of United Loyalists. Though the idea of a free settlement was abandoned in favour of a convict station, Matra may be credited with "the first formal proposal" for the colonization of New South Wales. In view of Banks' earlier advocacy, this does not perhaps amount to much.

Captain Phillip received his appointment, apparently through the influence of Lord Sydney, in October 1786, and the transports were gradually assembled; but it was not until the following May that the fleet sailed. The documents printed here give a vivid picture of the difficulties and delays encountered by Phillip, arising from the reluctance of the Admiralty and Home Office to assume more responsibility than they were obliged to, from the ill-repair of the vessels, the unrest among the sailors and marines, and the deplorable condition of the convicts. Phillip displayed the perseverance and foresight that later stood him in good stead, and it was almost entirely due to him that when the fleet sailed the most serious deficiency was "a great part of the Women's cloathing."

The majority of these documents have already been printed in the 'Historical records of New South Wales,' but the versions printed in the latter are occasionally defective in small details. The principal fresh material is Phillip's comments upon his instructions, and extracts from the log kept by Captain Hunter of the *Sirius*. Mr. Rutter has supplied an introduction and comments which link the documents together. G. R. C.

CANOES OF OCEANIA. By A. C. HADDON and JAMES HORNELL. Volume II. The canoes of Melanesia, Queensland, and New Guinea. By A. C. HADDON. (Bernice P. Bishop Museum. Special publication 28.) *Honolulu, Hawaii,* 1937. 11×7 *inches;* vi+342 *pages; illustrations*

The first volume of this exhaustive work was reviewed in the *Journal* for November 1937. Dr. Haddon's treatment of the technology of the canoes of his area falls, as would be expected, in no way short of the high standard achieved in Volume I by Mr. Hornell. It is not without significance that Oceanic canoes, in the variations of their form and structure, in their modes of locomotion, in their habitat, and even in their uses, offer special attractions to the marine biologist, since this designation could once be honourably claimed by both authors. By detailed description and by lavish illustration the morphology of the multitudinous types of canoes of the Western Pacific and of Queensland is here placed on record. Hulls, outriggers, sails, paddles, and decorative additions are described and analysed with a scientific skill which betrays the comparative anatomist. The study of the anatomy of the water-craft is the essential to the drawing of any conclusions as to past interrelationships between the peoples of the Pacific. Dr. Haddon does not in this volume concern himself greatly with the wider issues of Oceanic diffusion, since in Volume III the two authors will combine to discuss these complicated questions in the light of evidence derived from all aspects of native culture. At frequent intervals however he pauses in his technological descriptions to discuss problems of more local cultural transmissions, arising chiefly out of Polynesian and Micronesian contacts or colonizations. As is well known, the author's special field of investigation has for many years been New Guinea; for this reason, and also because of the great interest and variety of the water-craft of this area, it is not surprising that some 138 pages out of 331 of text are given up to it.

With this volume the account of the canoes of Oceania is completed, and we may congratulate the two authors on the production of a work of reference which is unlikely to be superseded, or even challenged, in our time. Volume III will set a seal upon labours which have lasted long and attained a fine fulfilment.

H. S. H.

PHYSICAL AND BIOLOGICAL GEOGRAPHY

CLIMATE: a treatise on the principles of weather and climate. By W. G. KENDREW. Second edition. *Oxford: Clarendon Press*, 1938 (*first published in* 1930). 9×5½ *inches;* x+328 *pages; illustrations and maps.* 15*s*

The first edition of this admirable work appeared in 1930 and was reviewed in the *Journal* for October 1931 (p. 387). The second edition has a little supplementary matter bringing statements and statistics up to date. Otherwise there is no change and all the maps and illustrations, including a number of photographs, are retained. A certain lack of system in the arrangement of the chapters and their contents is perhaps apparent, but this is more than compensated by the lucidity of the text and the masterly descriptions of climate from many parts of the world.

There is one statement (p. 130) in the book, not referred to in the earlier review, which seems sufficiently at fault to be pointed out: "Thunderstorm rain is usually heavier on the plains than on the hills. In the British Isles the heaviest rainfalls recorded in one day, or in shorter periods, are often considerably greater in the plains than in the mountains, since very heavy instability rain is not common in the mountains which lie in the cooler west and north; but excessive totals for a week or a month are more frequent in the mountains (*e.g.* Snowdon, 57 inches in October 1909)." This passage, which apparently only refers to the British Isles, may be true for Scotland and Ireland, but not for England and Wales, the mountains of which lie nearer to the heated plains in summer. The Pennine range, the Cheviots and the mountains of South Wales have a bad reputation for devastating thunderstorms and some of the worst cloudbursts in our annals have occurred from time to time at different points in these elevated tracts of country. The great cloudburst on Stainmore Forest, Westmoreland, on 30 June 1930 (*Geogr. J.*, 79 (1932) 156) was a typical case. In fact there is reason to suppose that mountains increase the tendency to severe convectional storms. L. C. W. B.

AN INTRODUCTION TO GEOLOGY. By A. E. TRUEMAN. *London: Thomas Murby & Co.*, 1938. 7½×4½ *inches;* x+258 *pages; illustrations and sketch-maps.* 4*s*

It is to be hoped that all teachers of geology will rapidly become aware of this excellent little book, which is primarily intended for use in schools. The scope and contents may best be indicated by the fact that it covers adequately the syllabuses suggested in the second report of the British Association. Although small, it is comprehensive and includes much recent work.

The author suggests, in many respects rightly so, that the teacher and reader should be responsible for forming a pictorial collection, but it seems a pity that the book is illustrated by diagrams, to the total exclusion of photographic plates. Questions and suggestions for practical work of a very helpful character are appended at the end of each chapter. W. G. V. B.

ECONOMIC AND HISTORICAL GEOGRAPHY

L'ESPÈCE HUMAINE. Edited by PAUL RIVET, with PAUL LESTER. (Encyclopédie Française. Tome VII.) *Paris: Comité de l'Encyclopédie Française (Dépôt: Librairie Larousse)*, [1936]. . . . 12½×10 *inches;* 602 *pages; illustrations and maps.* 225 *fr.* [*in artificial leather spring-back binding*]

"De tout le champ de notre histoire nationale, la race est expulsée. L'y réintroduire sous je ne sais quels prétextes, ce serait pour nous, Français, une régression

mentale." This dictum from the introduction by Professor L. Febvre sums up concisely the spirit which has inspired this volume of the new Encyclopédie française. The logical planning and presentation of the material is also characteristic of the French mind, clear, comprehensive, and urbane. Its three main divisions treat man to-day, peoples or races, and population statistics, the first section dealing with elementary forms of human activity and the peoples of the earth. It is impossible to indicate in more detail here the numerous problems discussed in this volume; in each case the rival theories of importance are analysed concisely and the objections indicated. There is throughout an avoidance of dogmatism and an insistence upon the paramount need for observation in place of intellectualization. Indeed the principal impression left upon the reader is our lack of certainty on almost every point concerned with the origin of man and his social and cultural manifestations. Man is portrayed as the artisan of his destiny, and the product of all the environments of his ancestors; the nation as the expression of Renan's "vouloir de vivre collectif." Certain modern theories of race are traced to idealistic conceptions of a common origin, which are not susceptible of proof.

The geographer will note that the peoples of the earth are treated in complete separation from their physical environment and that sketch-maps are reduced to a minimum. There is some danger in this divorce, but this aspect is to be examined in a subsequent volume. The association of the name of Lucien Febvre with the work is a guarantee that it will receive adequate evaluation. In the meantime, the geographer who wishes to acquaint himself easily with modern trends in ethnology and primitive sociology will find here a mass of well-arranged information. G. R. C.

HUNDESTAMMVATER UND KERBEROS. By FREDA KRETSCHMAR. (Studien zur Kulturkunde. Edited by LEO FROBENIUS. IV Band.) *Stuttgart: Strecker und Schröder*, 1938. Two volumes. 9×6 *inches*. Teil I. Hundestammvater. xiv+230 *pages*. Teil II. Kerberos. viii+292 *pages; illustrations and maps*. *M*.22

Freda Kretschmar is a pupil of Professor Leo Frobenius, whose massive tomes resulting from his expeditions to Africa and elsewhere are well known. This is her first major work, of which vol. I deals with the dog and its cousins the wolf, the jackal, the coyote, and other canines, in the rôle of tribal ancestor in all those parts of the world from which myths of this nature have been recorded. Vol. II deals with the Cerberus legend in all its many forms. The work is based on the earlier researches of Professor Koppers, who demonstrated the essential similarity and apparent common origin of what is here spoken of as the "canine mythology" of the peoples inhabiting the Asiatic and North American Pacific coasts. Extending this comparative method over a wider area, she examines in great detail not only the evidence obtained from living peoples but also that found in classical writings and in the paintings and sculptured remains of the great lost civilizations of Egypt, Mesopotamia, China, Mexico, and Peru. In the second part of each volume the various types of myth are classified, and deductions are drawn regarding their diffusion from one part of the world to another. Interesting observations are made on other aspects of culture with which the mythology of the dog has become incorporated, both in its aspect as life-giver and as the destructive guardian of the dead. Maps illustrate its distribution, confined chiefly to most parts of the northern hemisphere.

Ready-made generalizations, dear to the heart of the academic writer, regarding the things "all" primitive peoples think may be ignored. The main scientific interest of the work, apart from its encyclopaedic value, lies in its presentation

of the changes that a given mythological symbol is liable to undergo in various surroundings and in different stages of culture. The two volumes contain numerous line illustrations. There is a bibliography including some 800 authors, but no index. J. L.

COMMUNICATION HAS BEEN ESTABLISHED. By ASTLEY J. H. GOODWIN. *London: Methuen & Co.*, 1937. 8×5½ *inches;* xii+268 *pages; illustrations and sketch-maps.* 10*s* 6*d*

Mr. Goodwin has assembled in this book a series of brief and popularly written studies in culture history concerned with early migration, transport, and trade. Some of the chosen topics, like those on the sledge, wheel, and cart, Mediterranean sea craft, and the Roman road system, lend themselves to concise treatment at once comprehensive and vivid. In them Mr. Goodwin displays considerable skill in arrangement and draws attention to new or little-known points. Such for example is the effect of the difficulty of turning the four-wheeled waggon in maintaining the need for straight roads, until a satisfactory swivel axle for the front wheel was developed in the late sixteenth century. He also finds no lack of instances of the long persistence of inefficient devices, such as the classical chariot harness, through cultural inertia.

But in other parts of the book and particularly in the opening chapters on the first peopling of the continents, prehistoric routes, and the domestication of plants and animals, the field is too vast and our knowledge too tentative for successful treatment in so small a compass. The theme of growing means and range of communication appears unsuitable as a thread on which to hang an outline of our present knowledge, and facts are eked out by questionable assumptions. The author also seems to be less familiar with his material in these fields on which there is already a vast, scattered, and ever-growing literature. Much of the discussion on the origin and early development of agriculture and the domestication of animals in the Old World is out of date, and the references to the development of the use of bronze are inaccurate and misleading. For an earlier period the author sketches a vivid picture of Solutrean immigration into Europe based on the assumption that these peoples were the first palaeolithic hunters of the horse, which then penetrated Europe for the first time. But the famous layer of horse bones on the occupation site at Solutré is pre-Solutrean and associated with an Aurignacian industry, while the reindeer is the characteristic game animal revealed in European Solutrean sites.

The writing is also marred by overstatements and minor errors. Thus mixed oak, and not pine, forest was characteristic of Central Europe in the Bronze Age, and indeed ever since Boreal times. It is irritating to find Hallstatt, the type site of the first phase of the Early Iron Age in Europe, consistently misspelled. The suggestion that "the expansion and development of the Nordic tribes of the Baltic in the Iron Age were due to their long contacts with the Mediterranean folk" is misleading and inadequate, for that expansion took place at the expense of Celtic peoples whose Mediterranean contacts were much more extensive. Habitat conditions, which elsewhere in the book the author is at pains to stress, were probably of great importance in this connection, for the Germanic expansion coincided with the serious Sub-Atlantic deterioration of climatic conditions in northern Europe.

There is much in this volume of interest for the general reader, but the restricting of attention to communications has resulted in serious distortion in the treatment of the vast range of human culture touched upon within its covers. C. D. F.

GEOGRAPHY IN THE MIDDLE AGES. By GEORGE H. T. KIMBLE. *London: Methuen & Co.*, 1938. 9×5½ *inches;* x+272 *pages; illustrations and facsimile maps.* 15*s*

In this volume Mr. Kimble aims at presenting the "Development of medieval earth-knowledge as it was affected, on the one hand, by the prevailing idealogies and, on the other, by the results of human enterprise." The term medieval is rather widely interpreted, for his closing pages deal with Portuguese navigation in the sixteenth century: his interest, that is, lies in the throwing off of the shackles of patristic and classical geography.

The earlier chapters provide a clear summary of geographical thought from the fourth century to the intellectual renaissance of the thirteenth century, in which the author has made use of recent works on the history of science in general. Most of the writers were completely dominated by the past, but he shows that, particularly in physical geography, some were beginning to observe natural phenomena for themselves. Two chapters are devoted to "expanding horizons" in Asia and Africa. The latter deals with the mid-fourteenth century 'Libro del Conoscimiento,' which suggests a knowledge of the African coast, but so confusedly that it is rash to attempt to identify the place-names, and with the outlines of southern Africa on the Laurentian map of 1351. He considers that these outlines were added later, one from the Virga map of 1415 and the second at the time when the true outline was becoming clear to the Portuguese. This merely transfers the problem to the Virga map.

The later chapters discuss the geographical background of the great age of discovery. While these bring out many interesting points, their value would have been increased if the outlook were not so fixed upon the Portuguese sphere. He rightly stresses the lack of interest shown by fifteenth-century academic cosmographers in the achievements of their contemporaries: they however regarded their subject almost as a branch of classical studies, and beyond that circle in Italy a lively interest was evidently taken in the outside world. There is no reason to suppose that all knowledge of the East had disappeared. Throughout the century merchants were in touch with the fringes at least of the Orient; knowledge of the Portuguese advance also spread fairly rapidly. There is little in the alleged "lag" of cartography behind exploration, though, since the author does not draw from this the wider assumptions made by Portuguese historians, it is not perhaps a matter of consequence. As a sketch of the relation of Portuguese work to contemporary thought the book is extremely interesting, with material not to be found elsewhere in English. There are a number of excellent, though reduced, map reproductions. G. R. C.

MAGELLAN: pioneer of the Pacific. By STEFAN ZWEIG. Translated by EDEN and CEDAR PAUL. *London: Cassell & Co.*, 1938. 9×5½ *inches;* viii+312 *pages; illustrations and route-map.* 12*s* 6*d*

Magellan's achievement in planning and carrying through the most difficult portion of the first circumnavigation has rightly placed him in the forefront of the world's explorers, and many biographers have done adequate honour to his name. The justification of this latest work is the writer's enthusiasm for his hero, and his ability to present the man vividly to his readers. Magellan's character and the circumstances of his time provide many problems for solution. Herr Zweig makes no claim to originality in research, being content to interpret the accepted sources forcefully and with insight.

He considers that Magellan's plan was based upon the belief that the Rio de la Plata would provide a gateway to the southern sea, and that when this error was discovered there was nothing left but to persevere southwards on the

chance of finding another passage. The character of the La Plata estuary however was no doubt well known to the Portuguese by that time, and Magellan's plans were more likely based upon the accepted theory of a circumambient ocean and the analogy of the open sea off the Cape of Good Hope.

For the events of the voyage the writer has made good use of the account by Pigafetta, the sole member of the expedition to record his experiences. It is erroneous to suggest Pigafetta obtained his tales of the unvisited islands of the Indian archipelago from native informants. These marvels were simply part of the stock-in-trade of medieval cosmographers.

The introductory chapter is unsatisfactory. Too much of the general progress of exploration and navigation is attributed to Prince Henry, the cosmographical setting is distorted, and there are several errors. While these will not detract from the interest of the book for the general reader, they might have been avoided with a little care. G. R. C.

THE WAY OF A SHIP: an essay on the literature of navigation science. By LAWRENCE C. WROTH. *Portland, Maine: The Southworth-Anthoensen Press*, 1937. 10×6½ *inches;* xii+92 *pages; illustrations.* $3.00

"Neither seaman nor scientist, but a landlubber and a bookman" is the description given by himself of the author of this delightful essay on the theory and practice of navigation. Some years ago Mr. Wroth was charged with the task of arranging an exhibition of nautical books and charts at the John Carter Brown Library. In order to place the exhibits in correct relationship, and to prepare suitable descriptive labels, he was forced to consult various books of reference, and to inform himself upon a subject of which previously he had known little or nothing. As a result this essay was written, and it confirms a theory long dear to the reviewer, namely that there is no more lucid expositor than he who has mastered his subject for the first time overnight. True that Mr. Wroth had at his disposal all the treasures of the Carter Brown Library, but to a writer less gifted with skill to select and arrange, the very wealth of material might have proved an embarrassment. As it is, we have in this slender volume the best introduction to the history of nautical science, and the best guide to its literature and maps that any tyro could wish for, while in its format and in its choice of illustrative material, it will please the connoisseur even if offering him nothing new. Inevitably, of course, there are points of detail upon which the specialist will differ from the author. It is hardly correct to say (p. 22) that the discrepancy between the geographical and the magnetic north was not realized in Columbus' day, and the ancestry of Hadley's Quadrant should include Robert Hooke rather than Sir Isaac Newton. To pronounce that "the world breathed more freely" after Richard Norwood's re-measurement of the arc of the meridian is to give that able investigator a fame and an importance which he scarcely enjoyed in his native land, and certainly not outside it. Again, the inevitable compression of the account of the solution of the longitude problem has involved distortion, especially in its neglect of the advances made by the astronomers of the seventeenth century. Such blemishes however will pass unnoticed save by the expert and the mention of them will no doubt entice Mr. Wroth into probing more deeply into his subject. The 'Seaman's Glass,' which he is unable to identify (p. 70) was written by John Aspley, and first published in 1624 under the title 'Speculum Nauticum.' It is mentioned under its English title in William London's 'Catalogue of the most Vendible Books in England, 1656,' and enjoyed considerable popularity among mariners.

E. G. R. T.

GERMANY'S FIRST BID FOR COLONIES 1884–1885: a move in Bismarck's European policy. By A. J. P. TAYLOR. (Studies in Modern History. General editor: L. B. NAMIER.) *London: Macmillan & Co.*, 1938. 9×5½ *inches;* vi+104 *pages.* 7*s* 6*d*

Mr. Taylor's book is, as his sub-title indicates, a study in diplomatic, not in colonial, history. It is common knowledge that Bismarck had no interest in colonies as such, though there was a party in Germany which had. Recent writers have also shown that Bismarck was, at the time of Jules Ferry's supremacy, seeking an *entente* with France and giving some encouragement to French colonial ambitions. Scholars will regard Mr. Taylor's work as an attempt, and it would seem a successful attempt, based on all available evidence, to link these accepted facts together and give them greater precision. The general reader will no doubt regard it as a timely discussion of the historical origins of a problem of great immediate interest. How far the book is intended to point a moral need not be discussed here. But it may be suggested that Mr. Taylor is a little inclined to read the psychology of certain schools of twentieth-century thought into the mind of the Englishman of the Victorian Age. "The average Englishman," he writes, "was ashamed of the British Empire. . . . The aggressive Imperialism of the late nineteenth century . . . was merely part of the Diabolism of the Naughty Nineties." As Hr. Bodelsen showed in his 'Studies in mid-Victorian Imperialism,' the Imperialist movement began in Great Britain long before the 'nineties. Mr. Taylor would find it hard to produce evidence for his epigram. Nor is there any need to resort to such an explanation of the British attitude towards German colonial expansion. In general however the book is a sound and scholarly study, written in clear and readable style. W. P. M.

MEMORIES OF CHARLES DE FOUCAULD: explorer and hermit. Seen in his letters. By Father GEORGE GORRÉE. Translated by DONALD ATTWATER. *London: Burns Oates and Washbourne*, 1938. 9×5½ *inches;* x+168 *pages; illustrations.* 7*s* 6*d*

Father Gorrée's memoir of Father de Foucauld is a very revealing account of that remarkable man's life. It is compiled almost entirely from Father de Foucauld's own writings, his 'Reconnaissance au Maroc,' his letters, and his diaries. It is a more revealing though less readable work than René Bazin's 'Life' of the man who became known throughout the Sahara among the Tuareg and Arabs alike as the "White Marabut." The memoir is compiled on a strictly chronological basis; the excerpts from Father de Foucauld's writings are connected with the barest possible amount of letterpress and with particular emphasis given to the spiritual history and development of the subject. Composed from this point of view it is unfair even to regret that no map should have been provided and that so little should have been said of the people and places where de Foucauld lived, yet these omissions tend to make the book one rather for the student of modern mysticism than for the ordinary reader. The most lasting impression left with the reader of this life of a modern anchorite is neither that of the example which his life was to all the people with whom he came into contact, Europeans, Arabs, and Tuareg; nor of the drama of his own conversion from the rather dissolute cavalry officer to the efficient and courageous geographer, and finally to the intellectually developed hermit priest; but that of a man who remained spiritually restless and hungry till his death at the hands of the people he loved during an outbreak of frenzy engendered by the impact of the European War on the Sahara. For those who know something already of Father de Foucauld this memoir is almost a necessary document. It has been admirably translated into English. F. J. R. R.

LIVING AGAIN: an autobiography. By FELIX RIESENBERG. *London: Methuen & Co.*, 1938. 9×5½ *inches;* x+310 *pages.* 10*s* 6*d*

Mr. Riesenberg's autobiography opens with his boyhood in the raw Chicago of the 'eighties and comes to an incoherent end in the literary circles of present-day New York. In the meantime he had served ten years in sail and steam, after a rigorous education on a naval training-ship; taken part in Wellman's first Arctic expedition, when the non-rigid airship *America* remained four and a half hours in the air off Spitsbergen; and followed the profession of civil engineer in New York. From these experiences he drew the material for the novels and books on the sea which he was writing in the intervals. The chapters on his life as a sailor are the most attractive; he can set down the essentials of a passage through the Strait of Magellan or a hazardous moment in a hurricane on a lee shore with an effective economy, and sketches his numerous and assorted ship-mates with insight. He emerges from his own pages as efficient and quick-witted, prone to accept a risk but always pulling through, often by instinct or luck. The later chapters are less interesting to the general reader unversed in the personalities and crazes of the literary world. Apart however from a tendency to philosophizing and an occasional technical term, the book is very readable throughout.

GENERAL

MODERN GEOGRAPHY. Book I. Foundations of geography. By D. M. PREECE and H. R. B. WOOD. *London: University Tutorial Press,* [1938]. 8½×5½ *inches;* viii+360 *pages; illustrations and maps.* 3*s* 6*d*

This is the first volume of a proposed series of six to prepare pupils for School Certificate in Geography. The first portion of the book is concerned with the background of regional work and as such is useful. An excerpt of an Ordnance Survey Popular Edition map is provided and is made the basis of the first chapter. While the authors, with justification, show how much can be deduced from such a map, the reviewer feels that with children the section on place-names would be better omitted as being too liable to lead to erroneous conclusions. The succeeding chapters convey a great amount of information in a readily understood form. Occasionally one gets the impression of too sketchy a statement in the endeavour to present a simple picture: *e.g.* on p. 176, *re* cyclonic depressions: "The winds blow inwards to the low pressure area." The map on the facing page shows the obliquity of the winds, and this, being simply explainable, should have some mention. Wisely no reference is made to the more involved nature of cyclones with warm and cold fronts. The second third of the book deals with natural regions and gives a reasonable correlation between climate, vegetation, and human exploitation. The last portion deals with world topics. In chapter XXIV on town sites there is too categorical a classification of factors inducing town formation. Glasgow, on the basis of the list of factors, is said to owe its development on this site to the fact of its being in the centre of a fertile plain. While the authors suggest that a number of advantages can work together, the layout of the chapter tends to an opposite impression. Finally the work is well illustrated both by line and half-tone blocks and by distribution maps on Gall's and Mollweide's projections. A. C. O.

THE MONTHLY RECORD

FREEZING OF POLISH RIVERS

A paper by Zofia Paczoska in Polish, with a French summary entitled "La congélation des cours d'eau polonais," gives extensive information on the freezing of rivers in Poland, together with a bibliography extending back to 1861 and tables for certain rivers back to 1815. (*Études géographiques*. Travaux de l'Institut géographique d'Université à Poznań, fasc. 18–19, 1937.) The first part of the paper deals with the duration of the ice-cover in the principal rivers of the country, and the second part with physical researches into the relationship between freezing, air temperature, and river-discharge, though it is stated that the climate of Poland with its pronounced alternations of cold and warmth is hardly favourable to this line of work.

Notwithstanding the general uniformity of climate over the country the greater severity of the winter in the east than in the west is reflected in the duration of this ice-period. The usual time for the first appearance of loose floes is in the third decade of November in most parts of the country, but whereas in the eastern rivers the ice-cover is usually stabilized by the end of November, in the western rivers this is delayed till the first decade in January. The break up of the ice occurs about the third week in March on the Prypeć in the east and a month earlier on the Warta in the west. The period of the ice-cover between the dates of the first setting and the final breaking up of the ice is as follows: 61–70 days on the Warta and Vistula at Warsaw; 71–80 on the Niemen; 81–90 on the Dniestr; and 111–120 on the Prypeć. These figures take no account of interruption due to thaws, which in the western rivers occur several times each winter. The last floating ice is usually seen on the eastern rivers about the middle of April, and a month earlier in the west. There is an interesting contrast between the Prypeć and the Warta and Vistula in that in the former the total period of congelation is little longer than that of the stable ice-cover, whereas it is much longer in the two latter rivers. The dates quoted for freezing and thawing are those which are most frequent, not the arithmetic mean dates, which do not give such a good idea of the actual conditions experienced. The mean date of the stabilization of the ice is December 9 for the Warta at Poznań, December 19 for the Vistula at Warsaw, and December 24 for the Vistula at Cracow.

MOUNT EVEREST EXPEDITION 1938

Mr. Tilman's party has no wireless transmitter and consequently news from Mount Everest this year has been delayed and scanty. Despatches in *The Times* published up to June 27 were sent at the end of May and tell of the exceptionally early monsoon already indicated by the Indian weather reports.

It is stated that monsoon conditions began as early as May 5, after which the mountain was plastered in snow. In order to be well placed in the event of an early monsoon this year's party established the glacier camps earlier than ever before. Already in Sikkim conditions were unusual; there was exceptionally heavy rain which caused the higher passes into Tibet to be somewhat encumbered with snow. But once in Tibet conditions were good, much as in 1936 according to the messages, with the westerly wind abnormally light. Base Camp was reached by April 6 and by the end of April Camp III was fully stocked and occupied. But although the weather lower down had been fine and sunny, conditions at Camp III were far from pleasant, with the wind too violent and

temperatures too low to make any attempt on the summit. The North Col was however inspected and considered feasible, given a day or two of calm. Meanwhile so many of the party, and in particular the leader, were suffering from sore throats and coughs that Mr. Tilman decided to retire the whole expedition over the Lhakpa La towards the Kharta valley where, at a considerably lower altitude, the climbers could recuperate before returning to Camp III in the middle of May for the principal assault.

It snowed nearly all May, and when they came back the North Col did not look reassuring. But a way was made up, and Camp IV was established by four climbers and fifteen porters on May 26, after Oliver and two porters had had a fortunate escape from an avalanche. The route, admittedly dangerous, was roped up, but since snow conditions were so bad the camp was not occupied. Meanwhile Smythe and Shipton went round to the Main Rongbuk Glacier to attempt the slope up the west side of the North Col, not only to assess its value as a route of ascent, but also to find whether it could be used as an emergency way of escape. They descended to Rongbuk, which they reached on May 30, to fetch food and equipment.

It is reported in *The Times* for June 30 that the expedition is returning. It seems that a route was found up the west side of the Col and used; and that in spite of monsoon conditions the party reached Camp VI. But the experience of the Reconnaissance of 1935 indicated that above 23,000 feet the snow never settles, remaining as a powdery mass through which it would be extremely dangerous to attempt a difficult passage. M. A. S.

THE GERMAN NANGA PARBAT EXPEDITION 1938

Paul Bauer, who led the relief expedition after the disaster of 1937, has taken this year another German party of climbers to Nanga Parbat. Permission could not be given by Kashmir State, since the restricted permissions given by the Kashmir government for the use of coolies by expeditions had already been allotted. The present expedition has therefore approached the Indus valley through the North-west Frontier Province, journeying from Rawalpindi over the Babusar pass. The only climbing survivor of last year's party, the doctor Ulrich Luft, is again a member of the expedition. It is proposed to place a base for high climbing not far from Camp IV at about 21,000 feet which last year was overwhelmed by an ice avalanche. Transport is being assisted by an aeroplane working from Srinagar.

The climbers began to move equipment up the mountain on June 3, but heavy snowfalls in mid-June caused the party to return to Base Camp. A message published in *The Times* of June 27 states that the aeroplane has been in touch with the climbers and succeeded in supplying Camp IV (the base for high climbing) with 500 lb. of stores. M. A. S.

SANTA CATHARINA

The results of three journeys in Santa Catharina of Brazil made by Dr. Reinhard Maack fill an eighty-page supplement to the *Journal* of the Berlin Geographical Society. The excursions were made in 1927, 1930, and 1933, and his more detailed work was done in the coastal region where German and Italian settlers have established themselves, the former having been in occupation for a hundred years. The original colonization was due to the pioneer work of Dr. Blumenau, after whom one of the villages is named. At the date of the last census, out of 18,000 people in this vicinity 12,000 were German speaking. Steady growth of population is recorded in spite of the fact that the region, which lies between 26° and 29° S., is in the moist tropics where hook worm and

malaria are indigenous. Rigid observance of hygiene and prophylactic routine have served to all but stamp out the hook worm, although malaria is still common. The settled country lies along the valleys of some of the rivers that flow across a coastal strip from the inland highlands. In the valley of the Rio Itajahy-Mirim, which Dr. Maack particularly surveyed and mapped photogrammetrically on a scale of 1 : 50,000, the houses extend from about 300m. above sea-level to the village of Brusque at 25m. Between Brusque and the sea the area is swampy and is not inhabited. A series of illustrations show that the houses, roads, and clearings are well kept and that no serious inroads have been made upon the forest, or at least not to such an extent that serious soil erosion should be a menace. Mandioca is the principal crop.

Less favourable is the impression produced by the more southerly area, of which a map on the scale of 1 : 100,000 is presented, in which the Italian colonists are dominant. The villages are strung out along a railway running from Ararangua *via* Cresciuma to Tubarao, along foothills separated from the coast by swamps and a strip of sand-dunes reaching an individual height of 10 metres. There are a series of lagoons in this district apparently connected with the mouth of the river Ararangua, which is deflected towards the north-east for some miles by a sand spit. In the Cresciuma area there has been haphazard felling of forest and subsequent abandoning of the fields, with the development of an impenetrable tangle of secondary growth. There is a coal-mining industry near Cresciuma which might be of more importance were it not that the harbours along the coast-line of Santa Catharina are all rapidly silting up so that loading ships is becoming increasingly difficult. This fact and the presence of terraces along the rivers in their lower courses are taken as evidence that the whole coastal belt has suffered recent uplift.

The lion's share of the volume is devoted to an account of the geology of the province of Santa Catharina, and it is shown that the morphology depends closely upon structure. The bulk and western part of the province forms a high plateau, the drainage of which collects in the Rio Uruguay. It is formed by the lava-capped gently tilted Gondwana beds, and whilst running at about 1200m. to 1400m. (say 4500 feet) above sea-level at its eastern margin culminates in a summit at 2200m., Serra Irapua. A narrow steep zone dominated by the escarpment runs more or less from north-west to south-east across the province, and although forming a fine spectacle does not any longer serve as the precise watershed, the Rio Negro in the north having in one place cut across it. All this country is covered by rain forest and receives a higher precipitation annually than the coastal lowland which forms the third topographical division. Although the area of this is about one-third of the whole province it carries two-thirds of the whole population. In it the dissection is still considerable, several ranges running with a east-north-easterly trend reflecting the folding of the strata are found and they rise to an elevation of 500–700m. The author emphasizes that this direction, and one roughly at right angles to it along which many igneous dykes are aligned, appear again and again in the geographical features of Brazil. After a detailed study of the geology, it is concluded that there is complete harmony between the Gondwana beds of Brazil and of Africa, and this is regarded as evidence strongly in favour of Wegener's hypothesis of Continental Drift.

The book is well illustrated by photographs and diagrams, whilst in the pocket at the end two large-scale topographical maps of the special areas are enclosed and a small-scale geological map of the province as a whole.

J. V. H.

GEOGRAPHICAL COLLECTIONS AND CONNECTIONS OF ELIHU YALE

From Mr. Hiram Bingham, of Washington, D.C., we have received an interesting note on the geographical collections and connections of Elihu Yale, the patron of Yale University. A new map of the United Provinces was dedicated to Yale by the Queen's Geographers, Senex and Price, in 1709, while on 12 September 1711 he himself presented the four published volumes of Moses Pitt's great 'English Atlas' to St. Paul's School. According to the inscription found in each of the volumes (which are still preserved) the donor requested that they "be kept in the Master's House for the use of his boarders," by whom some part should be read "at least twice every week." As himself a traveller, "Born in America, in Europe bred, In Afric travell'd, and in Asia wed" (so his epitaph reads), Elihu Yale was convinced of the value of geography in education. Upon his death in 1721 his effects were disposed of by public auction, and numerous items of geographical interest appear in the catalogues which were printed for each day's sale. His collection of surveying and astronomical instruments included "A Brass Cinecal [*sic*] Quadrant, a brass Semicircle, an Elliptick double Dial, and a brass universal ditto, a small brass equinoctial Ring Dial . . . a large Gunter's Quadrant, a Horological Sector, with a large Semicircle for surveying . . . a large celestial Globe of Brass, a small terrestrial ditto, a large Equinoctial Universal Ring Dial." There were further two pairs of globes (one by Senex), a barometer, a telescope, and five "Spying glasses." The books included 'A new general atlas,' perhaps Herman Moll's, a copy of Speed, Ray's (listed as Bay's) 'Travels,' and Moxon's 'Mechanick exercises.' Most of the items however, including "seven books of maps," are unfortunately unnamed in the catalogues. Mr. Bingham would welcome any hitherto unpublished material concerning Governor Yale, upon whose biography he is engaged.

OBITUARY

SIR SPENCER HARCOURT BUTLER, G.C.S.I., G.C.I.E.

Sir Harcourt Butler, who died on March 2, at the age of sixty-eight, had had a long and most distinguished career as an administrator in India and Burma. He was the son of Mr. Spencer Percival Butler and a nephew of Dr. H. M. Butler, Master of Trinity College, Cambridge. Entering the Indian Civil Service in 1888, he went out to what is now the United Provinces of Agra and Oudh. There he performed valuable services as secretary of the Famine Commission, and was responsible, as Deputy Commissioner of Lucknow, for many improvements to that city. In 1907 he was chosen as Secretary of the Foreign and Political Department, in which office he established cordial relations with the Ruling Princes, and three years later he became the first Education Member of the Executive Council. From 1915 to 1918 he was Lieutenant-Governor of Burma, where he continued to display his interest in education by raising funds for a teaching university at Rangoon. Before his term had expired he returned to his old Province as Lieutenant-Governor to inaugurate the constitutional changes which followed upon the Act of 1919. A similar task fell to him when he was appointed the first Governor of Burma in 1923. During this term of

office he made a journey to the unadministered Naga country to deal with slavery and human sacrifices to evil spirits, both of which practices he went far in abolishing.

Sir Harcourt joined our Society in 1920. On his retirement he served as a Member of Council from 1928 to 1933, then as a Vice-President, and finally as Treasurer from 1934 to 1936. He maintained his earlier interests in education by serving as Chairman of the governing body of the School of Oriental Studies from 1931.

MEETINGS: SESSION 1937–38

Fourteenth Evening Meeting, 23 May 1938. Professor Kenneth Mason, Deputy President, in the Chair

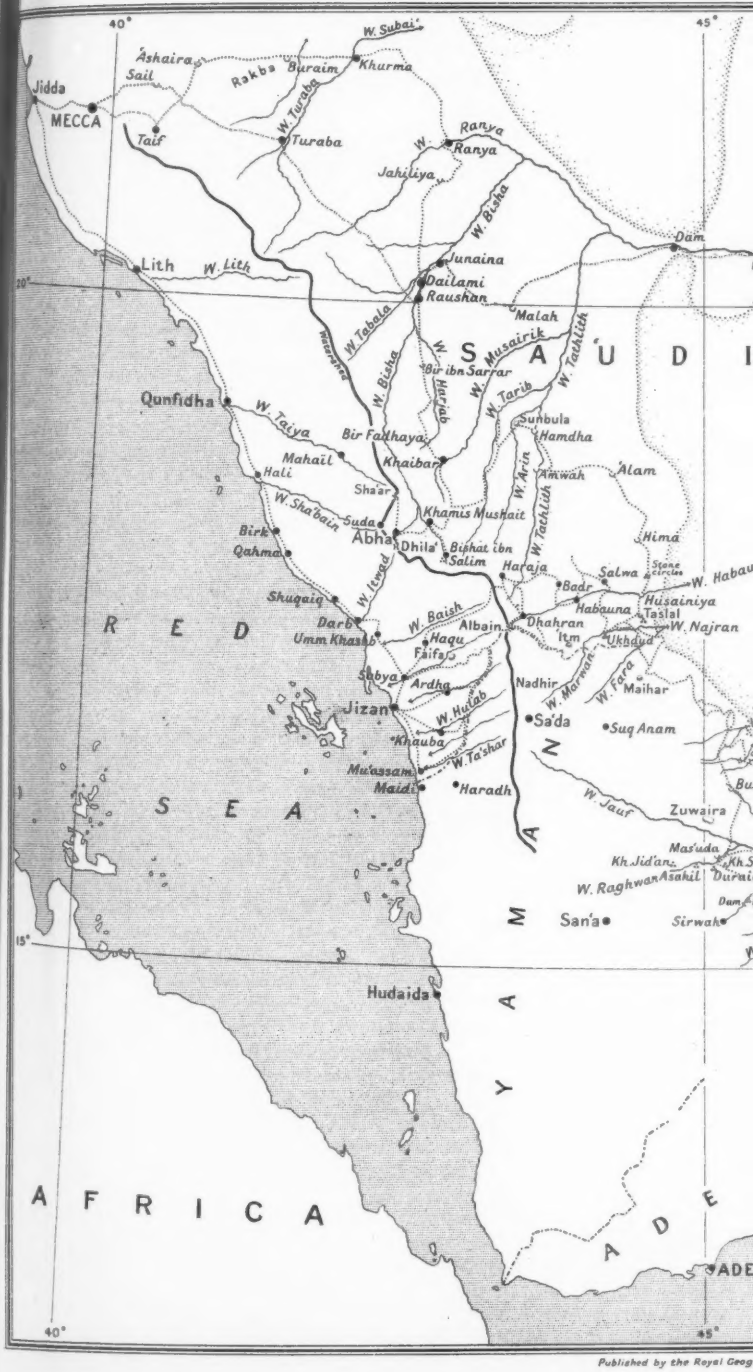
Elections: Frederick Ehrenfried Baume; Major Frederick Denton Field, R.A.; Ian Bernard Gaskell; P. E. C. Hayman; Alexander King; Harold C. McCarthy; William Anthony Purnell; Robert Scott Russell; Reverend Peter Wiseman, D.D.

Paper: The country between the Fly and Sepik rivers, New Guinea. By Mr. Stuart Campbell

Fifteenth Evening Meeting, 13 June 1938. Professor Kenneth Mason, Deputy President, in the Chair

Elections: Charles Beltrand Alexander; Russell Beverley; M. T. Browne; P. W. Bryan, B.SC., PH.D.; The Reverend Albert Edward Cann; Mrs. Agnes Mary St. John Cooke; Miss Frances Elizabeth Creswick; Captain C. A. M. Cumberlege, R.A.; The Reverend Clifford Hubert Davies, M.A.; Neville Dawson, B.A.; Dhirendra Nath Dhar, B.A.; Dwarika Nath Dhar; H. I. Husain Hilmy Didi, M.R.A.S.; Wilfred Eastwood; Brian Seymour Vesey-FitzGerald; Michael Edward Gibb, B.A.; Anthony Gross; Stanley Robert Hall; Lady Grizel Hamilton; Leonard William Henry Hide; Stanley Cecil Howard; Philip Gaved James; Marshall Laird; The Reverend Francis Edwin Lamb; Malcolm Horace Lindsey; Miss Janet Martha Loveluck, B.A.; Vinasitamby Kadirgama Nathan; His Grace the Duke of Northumberland; Frederick Leigh Leigh-Pollitt; Mrs. Mary Priestley; Alexander Thomas Tammadge Shanley; Alfred St. Alban Smith; Raymond James Sutton; Alfred William Talbert; Ewen Cameron Thomson, B.SC.; John Charles Walker; C. V. T. Wells; Cyril James Whittle, M.SC.; Anthony Talbot de Burgh Wilmot, B.A.; Col. A. R. G. Wilson

Paper: Recent travels in the Hadhramaut. By Mr. Harold Ingrams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W. Ranya
Ranya
Jahiliya
W. Bisha
Dam
Junaina
Lith
W. Lith
Dailami
Raushan
Malah
W. Tabala
W. Musairik
W. Tachlith
S A U D I
Bir ibn Sarrar
W. Bisha
W. Tarib
Qunfidha
W. Taiya
Bir Fathaya
Sunbula
Hamdha
Khaibar
Mahail
Hali
Sha'ar
W. Shabain
Suda
Abha
Dhila'
Bisha
Salim
Khamis Mushait
W. Arin
W. Tachlith
Amwah
'Alam
Hima
Birk
Qahma
Hafaja
Salwa
Stone circles
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Shuqaiq
W. Itwad
Darb
W. Baish
Albain
Dhahran
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Taslal
Husainiya
W. Najran
R E D
Umm Khasha
Haqu
Faifa
Itm
Ukhdud
Sabya
Ardha
Nadhir
W. Marwani
W. Fara
Maihar
Jizan
W. Hulab
Sa'da
Suq Anam
Khauba
W. Ta'shar
Mu'assam
Maidi
Haradh
W. Jauf
Zuwaira
S E A
Masuda
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Sirwah
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Hudaida
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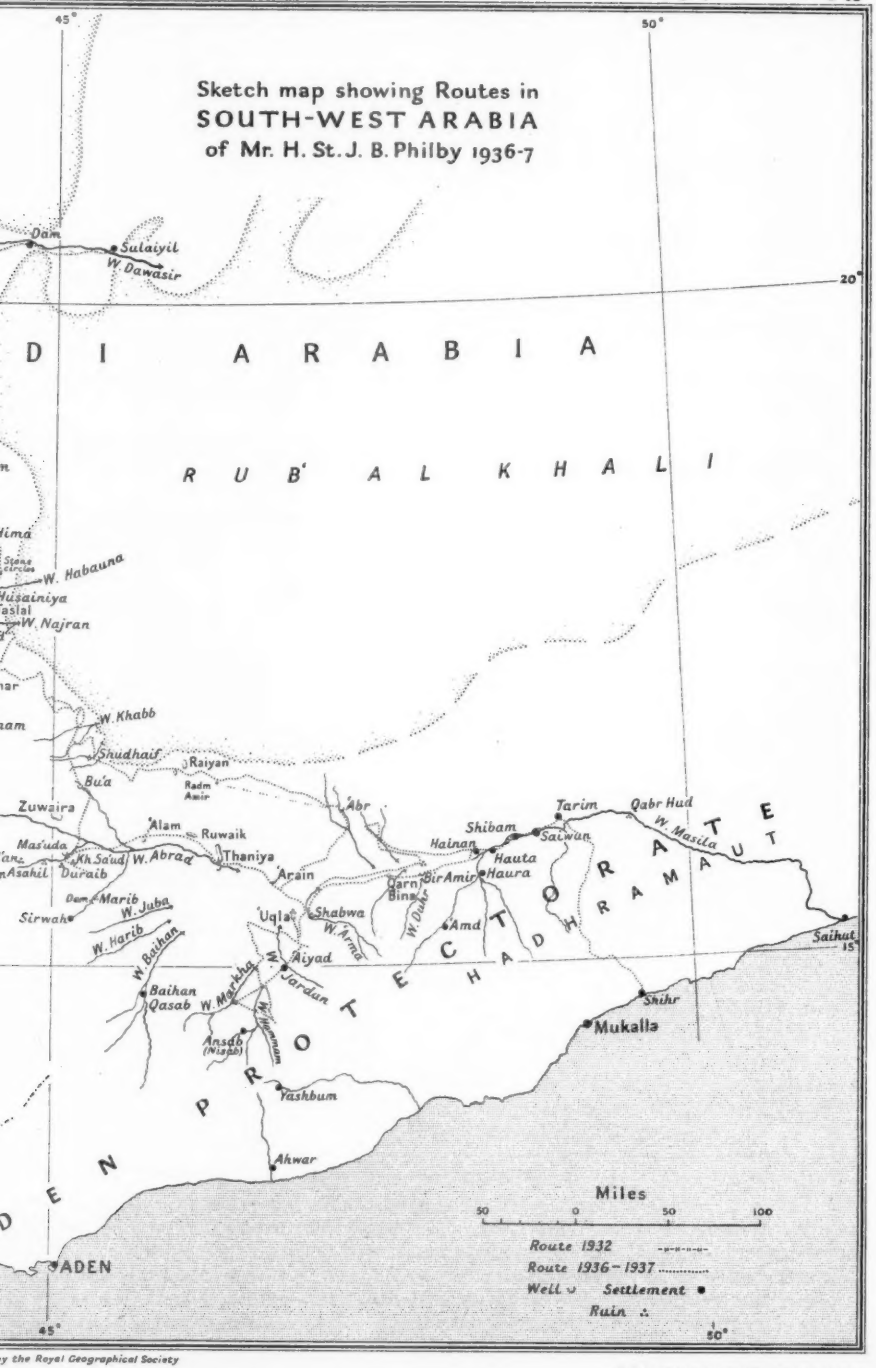

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SOUTH-WEST ARABIA
Philby

Based upon the Ordnance Survey Map with the sanction of the Controller of H.M. Stationery Office.

Blechingley
South Park
Crowhurst
Blindley Heath
Limpsfield
Oxted
Hurst Green
Tandridge
Godstone
Caterham
Smith Book
Harrowsley Green
Thunderfield Castle
Hingfield
Mount Noddy
Pilgrate
Beech Farm
Charlham Park
Tasing
Ashurst
EAST GRINSTEAD
Riddlehill
Standen Street Row
Wiesboech
Stonefield
Hartfield
Withyham
Forge
Ordnish
Grubb
Steel
Rocks
Hoathly
Sharpthorne
Balcombe
Ardingly
Horsted Keynes
Chelwood Gate
Lane Wood
Danehill
Maresfield
Morphews
Uckfield
Lindfield
Fletching
Newick
Buxted
Framfield
Ridgewood
Little Horsted
Wivelsfield
Wivelsfield Green
Ashfield
Hawkhurst Common
LONDON TO BRIGHTON
LONDON TO EASTBOURNE

Hollow
Hildenborough
Tonbridge
Hilden
Newcastle
Pembury
Tunbridge Wells
Frant
Lamberhurst
Goudhurst
Horsmonden
Marden
Pococks Gate
Emly Farm
Wadhurst
Tidebrook
Hawkhurst
Sandyden
Chant Farm
Wallbons
Rotherfield
Willingbury Wood
Bardown
Bellhurst
Shovelwell
Hammerden
Etchingham
Argos
Mayfield
Burwash
Meers Farm
Burgate Hill
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Dallington
Hastings
Warbleton
Ruxden
Thornedale
Penhurst
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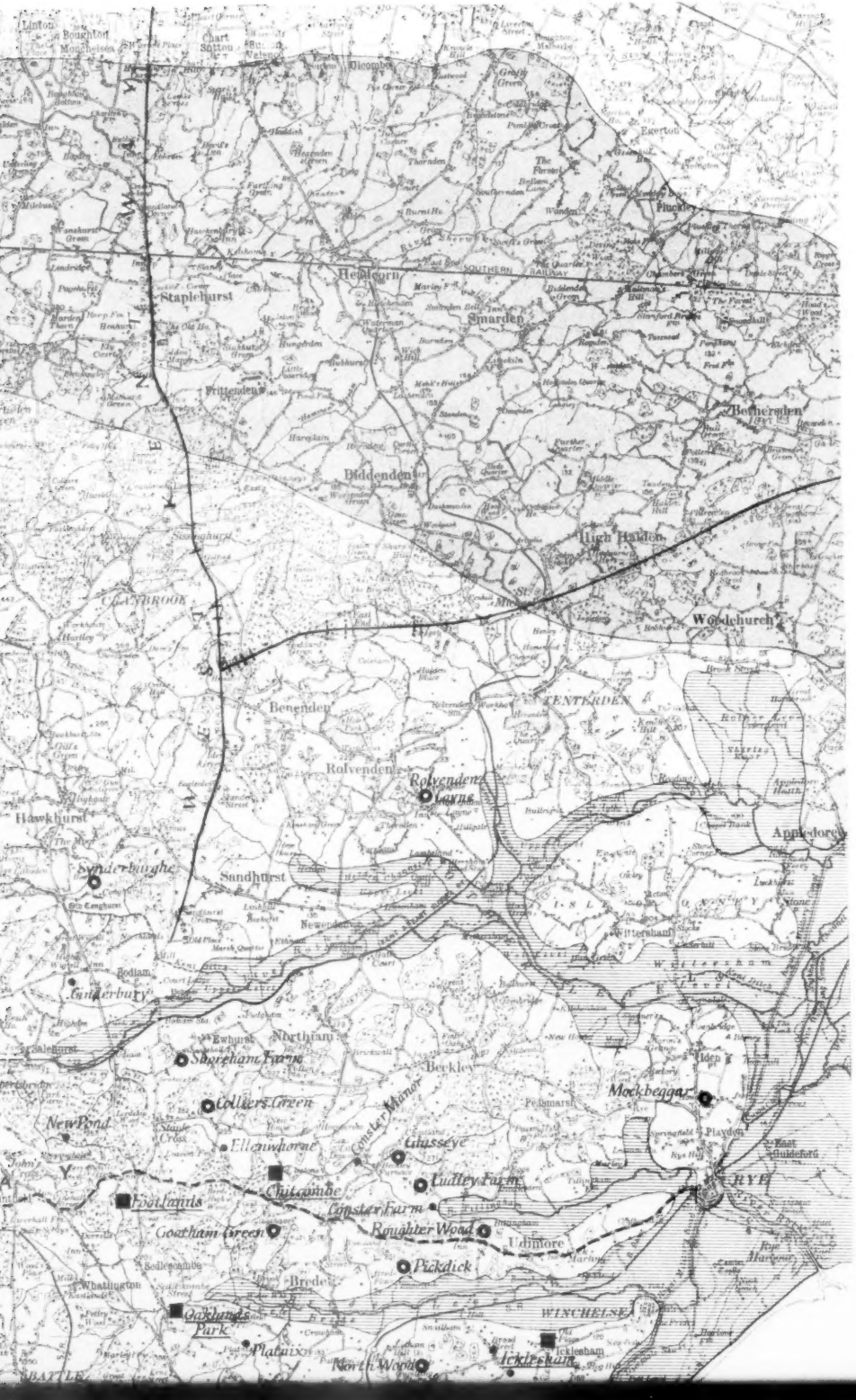
Summerbee Farm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High Halden
Woodchurch
CRANBROOK
TENTERDEN
Benenden
Rolvenden
Rolvenden Layne
Hawkhurst
Sandhurst
Appledore
Rodlam
Canterbury
Ewhurst
Northiam
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Beckley
Mockbeggar
Colliers Green
New Pond
Ellenthorne
Chitcombe
Ludley Farm
RYE
Foot Lanns
Goatham Green
Udimore
Pickdick
Brede
Oaklands Park
WINCHELSEA
Ickleham
North Wood
BATTLE

Billingshurst
Nuthurst
Cowfold
Bolney
West Grinstead
Twineham
Henfield
Ashington
Steyning
Bramber
Upper Beeding
Findon
Patcham
Portslade
Hove
Brighton
Shoreham-by-Sea
South Lancing
Worthing
Goring
Sompting
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Burgess Hill
Hurstpierpoint
Pyecombe
Clayton
Keymer
Hassocks
Ditchling
Plumpton
Albourne
Thakeham
Storrington
Washington
Patching
Clapham
Lyminster
Broadwater
Offington
Tarring
Shipley
Coolham
Horsham
Haywards Heath
Cuckfield
Slaugham
Warninglid
Lower Beeding
Mannings Heath
Southwater
Newbridge
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Worth
Balcombe
Ansty
Wivelsfield
Ditchling Beacon
Wolstonbury Hill
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Truleigh Hill
Devil's Dyke
Newtimber Hill
Blackcap
Ashcombe Hill
Perching Hill
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Preston
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Addington
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Anerley
Norwood
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Tooting Graveney
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Pimlico
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Upminster
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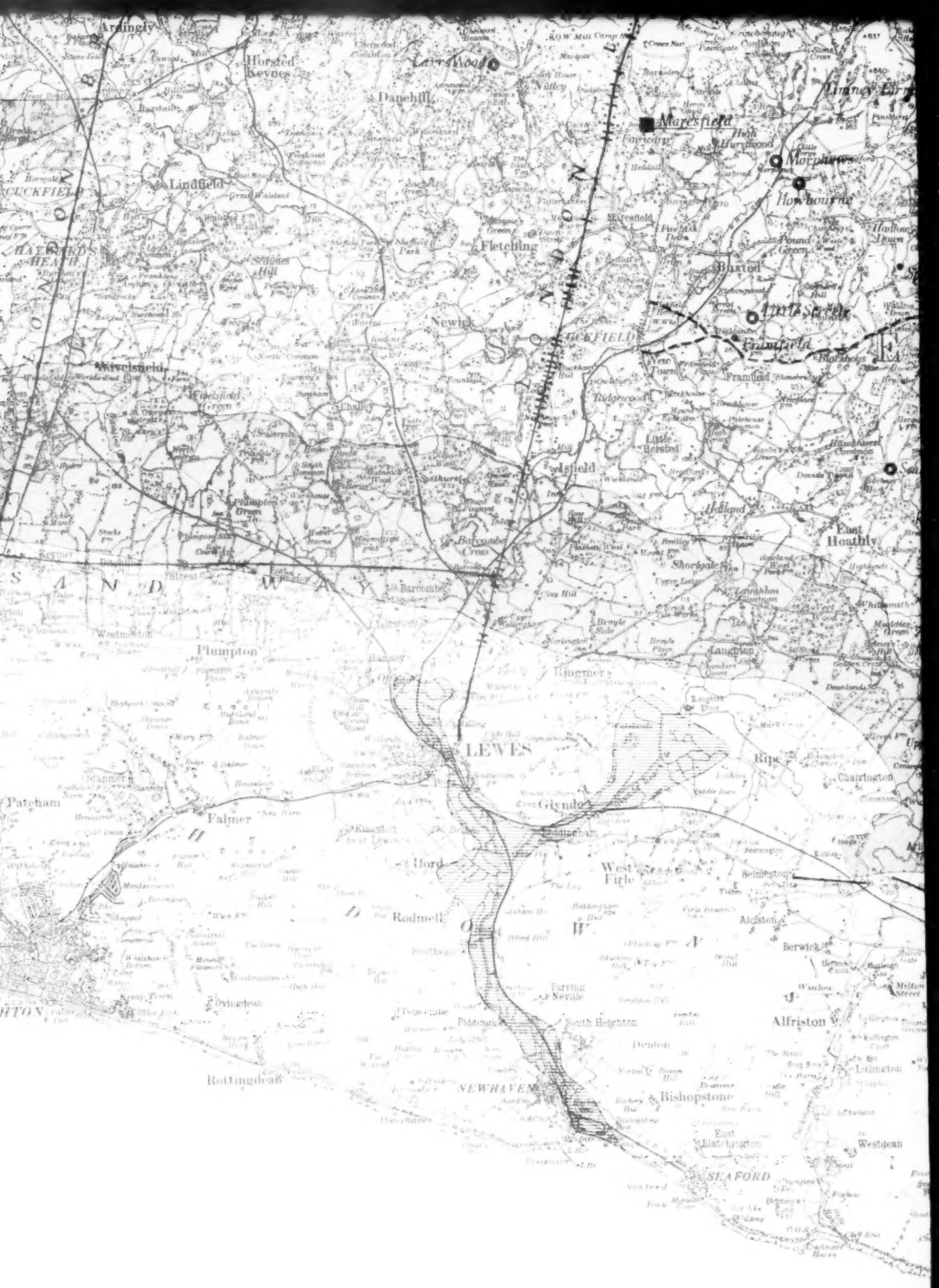

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Howbourne
Morphews
Marsfield
Hurstwood
Fairseat
Binfield
Spreds Farm
Little Saxbys
Framfield
Broadhurst Green
Heathfield
Broomtown
Brightling
Little London
Waldron
Dallington
Herstmonceux
Warbleton
Swallow Bridge
Marle Green
Knole Wood
Maynard
East Hoathly
Summerfree Farm
Pudden
Thornsdale
Pear Tree
Penhurst
Peppering Eye
Catsfield
Fryer Wood
Ninfield
Byne's Farm
Cole Wood
Henniker Wood
Hooe
Wartling
Hellingly
Upper Dicker
Hailsham
Ripe
Chalvington
Glynde
Arlington
West Firle
Alciston
Berwick
Polegate
Pevensey
Westham
Pevensey Bay
Willingdon
Lower Willingdon
Jevington
Langney Point
Bishopstone
South Heighton
Denton
Alfriston
Tarring Neville
East Blatchington
Seaford
Eastbourne
Friston
Eastdean
Beachy Head
Newhaven
Lewes
Ringmer
Laughton
Shorlands
Shovelstrode
Bellhurst
Newpond
Brightling
Battle
Bexhill
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THE WEALD

ROMAN ROADS & IRONWORKS

Scale 1/150,000

Miles

1 0 1 2 3 4 5 6

ROMAN ROADS
- Scattered cinder
- Metalled layer up to 50% of cinder
- Metalled layer mainly cinder

RIDGEWAY

ROMAN IRONWORKS
- Romano-British (underlined)
- British Major
- British Minor

Alluvium Weald Clay Hastings Beds

E. Straker & I. D. Margary